

4

ENVIRONMENTAL CONSEQUENCES

This chapter describes the environmental consequences (impacts) of implementing the No Action Alternative and Alternatives 4 and 4V. Because the study area is partly within the historic and monumental core of the District of Columbia, potential impacts to land use, aesthetics, parkland, and cultural resources are of particular importance. Transportation, air quality, and noise are also major potential impact areas. Other potential environmental impacts considered include impacts on socioeconomic conditions, Kennedy Center operations, urban systems, natural resources, and hazardous materials.

4.1 Land Use and Zoning

4.1.1 No Action Alternative

The No Action Alternative would have no impacts on existing land use or zoning in the study area as described in Subchapter 3.1.1.

4.1.2 Alternative 4

4.1.2.1 Land Use

Alternative 4 would have no negative impacts on land use in the study area as described in Subchapter 3.1.1. It would have substantial positive impacts, both direct and indirect.

The implementation of Alternative 4 would maintain existing infrastructure with improvements in all three sectors. There would be no substantial changes in the amount or nature of land presently used for roadways or trails. Some land currently occupied by parkland would be converted to roadway, some land currently occupied by roadway would be converted to parkland, with an overall slight increase in the latter (see Subchapter 4.6). A floating dock would be built to allow access from the river by boats and potential water taxis. The general efficiency and connectivity of the transportation network (including traffic operations, bicycle and pedestrian access, mass transit, and water transport) would be improved.

The deck proposed over the Potomac Freeway east of the Kennedy Center would substantially increase the amount of developed land in the study area. The deck would support a landscaped plaza and space for the construction of two new buildings. Beneath the deck a parking garage would be constructed adjacent to the existing Kennedy Center garage. The land use represented by the new landscaped plaza would be fully compatible with existing surrounding land uses, particularly with the Center itself. The plaza would provide a monumental setting in keeping with the Kennedy Center's status as a presidential memorial and a national showcase for the performing arts.

The proposed deck and plaza would make possible the construction of two new buildings on the deck. One building, the Education Center, would house educational programs; the other, the Rehearsal and Office Building, would provide rehearsal and administrative space for the Kennedy Center. The buildings would be an extension and enhancement of the Center and would represent a positive new land use in the study area, compatible in design and function with surrounding land uses.

4.1.2.2 Zoning

The proposed improvements in the South and North Sectors would occur on unzoned federal land and would have no impacts on zoning.

As indicated in Subchapter 3.1.2, the proposed deck and plaza, as well as the two buildings to be constructed on the deck, would be built in an area currently zoned SP-2 by the District of Columbia. Types of use allowed under this zoning category are described in Subchapter 3.1.2. The plaza and proposed new buildings would be compatible with existing zoning and likely require no re-zoning. Thus, Alternative 4 would have no impacts on zoning.

4.1.3 Alternative 4V

4.1.3.1 Land Use.

The impacts of Alternative 4V on land use would be the same as those of Alternative 4. There would be substantial positive impacts and no negative impacts.

4.1.3.2 Zoning

The impacts of Alternative 4V on zoning would be the same as those of Alternative 4. There would be no impacts on zoning.

4.2 Relevant Plans, Studies, and Projects

Plans, studies, and projects relevant to the proposed action and the study area are summarized in Subchapters 1.3 and 3.2, and described more at length in Appendix D.

4.2.1 No Action Alternative

Under the No Action Alternative, no access improvements would be made to the Kennedy Center. While the No Action Alternative would not contribute to advancing the general goals of the plans and studies summarized in Subchapters 3.2.1 through 3.2.4, it would not hinder their progress.

However, the No Action Alternative would not be compatible with, and thus would have a

substantial negative impact on, elements of the plans that pertain directly to the Kennedy Center and its immediate surroundings. In particular, the No Action Alternative would be incompatible with NCPC's vision for the area east of the Kennedy Center, expressed in the *Extending the Legacy* Plan (NCPC, 1997) and summarized in Appendix D, Section D1. Nor would the No Action Alternative support NCPC's goal of creating a new link between the riverfront and the Kennedy Center, as outlined in *Washington Waterfronts* (see Appendix D, Section D1).

Other plans, studies, and projects described in Subchapter 1.3.3 and 3.2.5 and in Appendix D do not depend on improving access to the Kennedy Center for their completion. Consequently, the No Action Alternative would have no impact on these plans, studies, and projects.

4.2.2 Alternative 4

Generally, Alternative 4 would either positively affect the plans, studies, and projects summarized in Subchapters 1.3 and 3.2 (described in more details in Appendix D), or it would have no impacts on them. All features of Alternative 4 are consistent and compatible with these plans, studies, and projects.

4.2.2.1 Extending the Legacy

Alternative 4 would have a substantial positive impact on NCPC's *Extending the Legacy* plan (described in Appendix D, Section D1) because it would directly implement an important element of the plan by constructing a monumental plaza east of the Kennedy Center. The proposed preliminary design for the plaza, as well as the two buildings to be constructed on it, are directly inspired by NCPC's vision. By reconnecting the Kennedy Center to the city's historic street grid, Alternative 4 would contribute to the revival and enhancement of the historic L'Enfant and McMillan plans that is promoted by *Extending the Legacy*.

4.2.2.2 Washington's Waterfronts

Alternative 4 would directly implement one of the objectives of the *Washington's Waterfronts* plan (described in Appendix D, Section D1) by providing pedestrian access to and from the Kennedy Center and the waterfront via a monumental stairway. Alternative 4 also would include a boat dock at the base of the stairway, as called for by the plan. Impacts would thus be substantial and positive.

4.2.2.3 Georgetown Waterfront Plan

This plan (described in Appendix D, Section D3) has only minor relevance to the project, and Alternative 4 would not directly affect the creation of the Georgetown Waterfront Park. However, an indirect positive impact would be that the waterfront access to the Kennedy Center and better pedestrian and bicycle trail connectivity provided by Alternative 4 via Thompson's Boathouse would facilitate pedestrian and bicycle activity within and near the Georgetown Waterfront Park.

4.2.2.4 Theodore Roosevelt Memorial Bridge Study

Alternative 4 would be fully compatible with the Theodore Roosevelt Memorial Bridge Study (see

Appendix D, Section D4). Because the South Sector access improvements under this Alternative and the Roosevelt Bridge Study transportation alternatives overlap, coordination between the project teams would be an important part of implementing this alternative.

4.2.2.5 The Kennedy Center Improved Access and Parking Project

This project, which is described in Appendix D, Section D5, is currently underway and should be completed by 2004. Alternative 4 is fully compatible with this project's improvements.

4.2.2.6 Comprehensive Plan for the National Capital

Federal Elements

Alternative 4 would contribute positively to the federal elements of the *Comprehensive Plan for the National Capital* as outlined in Subchapter 3.2.1.1 and Section D10.1 of Appendix D. Regarding the Federal Goals for the National Capital, Alternative 4 would help achieve the planning objectives of this element by enhancing the city's aesthetics, historic features, cultural resources, waterfront access, environmental quality, transportation efficiency, and visitor accommodation. Alternative 4 would support the Federal Facilities element because the proposed transportation improvements, the proposed deck and plaza, and the buildings to be constructed on the deck would contribute positively to the efficient and effective operation and general order and beauty of the city. Alternative 4 would positively contribute to the Parks, Open Space and Natural Features element by enhancing the cultural and recreational opportunities offered by the Kennedy Center through the addition of a new plaza, space for educational and performance purposes, and a waterfront access point. The transportation improvements in Alternative 4 would be compatible with the Federal Environment element because they would not have major negative impacts on noise and air quality (see Subchapters 4.4 and 4.5). The proposed plaza and buildings would provide a new attraction for tourists and visitors and enhance their experience of the city, in keeping with the goals of the Federal Visitors to the National Capital element. Because it would enhance the city's historic street grid near the Kennedy Center, Alternative 4 would also contribute to advancing the Preservation and Historic Features Element, as discussed further in Subchapter 4.7.

District Elements

Alternative 4 would contribute positively to the District elements of the CPNC as described in Subchapter 3.2.1.2 and Section D10.2 of Appendix D. In particular, implementation of Alternative 4 would create many temporary construction jobs over the course of the entire construction campaign as well as a few permanent operational positions, which would support the Economic Development element of the plan (further discussion of socio-economic benefits of this alternative is presented in Subchapter 4.9). Alternative 4 would meet the goals of the Transportation element by enhancing transportation to the Kennedy Center and through the study area, as discussed further in Subchapter 4.3. It would also meet the goals of the Urban Design element through the creation of a grand plaza and setting for the Kennedy Center. The proposed action would also generally support or be compatible with the goals of the Environmental Protection element, the Preservation and Historic Features element, and the Land Use element. It would also be fully compatible with the objectives of the Ward 2 Plan.

4.2.2.7 Priorities 2000: Metropolitan Vision, Circulations System

Improved traffic patterns, improved pedestrian circulation, and new waterfront access as proposed under Alternative 4 would be fully compatible with MWCOG's vision in Priorities 2000 (described in Subchapter 3.2.2) to integrate modes of transportation into a fully-interconnected network.

4.2.2.8 A Transportation Vision, Strategy, and Action Plan for the Nation's Capital — Department of Public Works, District of Columbia

The waterfront access and boat dock included under Alternative 4 would support this transportation plan's goal (described in Section D12 of Appendix D) to have water taxi docks at the Kennedy Center. Alternative 4 would not affect other components of this plan.

4.2.2.9 WMATA's Transit Service Expansion Plan

Alternative 4 would be fully compatible with WMATA's Transit Service Expansion Plan, which is described in Subchapter 3.2.4.

4.2.2.10 Other Projects

The implementation and completion of the plans and projects described in Sections D6 through D8 and D13 through D16 of Appendix D is independent of any action taken at or near the Kennedy Center and would not be affected directly by the proposed action. In the long term, Alternative 4 would have an indirect positive impact on these projects because they would benefit from the creation of a better-integrated, more attractive, and more accessible neighborhood.

4.2.3 Alternative 4V

Generally, the impacts of Alternative 4V on relevant plans, studies, and projects would be the same as those of Alternative 4. All features of Alternative 4V are consistent and compatible with the relevant plans, studies, and projects discussed above.

4.3 Transportation System

4.3.1 Pedestrian Access

4.3.1.1 Introduction

Two different methods were employed to assess pedestrian impacts. The first was to compare the crossings associated with each alternative. The second was to evaluate the walk paths and walking times associated with each as a measure of convenience to pedestrians wishing to access the Kennedy Center.

Estimates were developed of the walk times and distances required to access the Kennedy Center

from five points on or near the edge of the study area:

- Thompson's Boathouse.
- Foggy Bottom Metro Station.
- The Bernardo de Gálvez Statue (at Virginia Avenue and E Street).
- The Roosevelt Bridge (north and south sides).
- Lincoln Memorial.

Walk-time estimates were based on measured walking distances, an average walking speed of 1 meter per second (equivalent to 2.2 miles per hour or 3.3 feet per second), and delay times associated with waits at corners to cross streets. The walking speed used is appropriate for a broad range of pedestrians.

4.3.1.2 No Action Alternative

Crossing Assessment

Under the No Action Alternative, no improvements to pedestrian street crossings providing access to the Kennedy Center would be made. No known pedestrian improvement project depends on the proposed action for its completion. Therefore, the No Action Alternative would have no impacts on pedestrian circulation in the area. Conditions under the No Action Alternative are described below.

For the purposes of crossing assessment, seven critical intersections were identified and evaluated, as summarized in Table 4.3-1. Under the No Action Alternative, only the E Street/23rd Street intersection would meet desired pedestrian crossing characteristics, although it would still lack a countdown signal. The remaining intersections would all lack an adequate median as well as countdown signals. Of all studied intersections, the Potomac Freeway/Ohio Drive intersection exhibited the worst characteristics. Table 4.3-1 summarizes these conditions as observed for key crossing locations.

Walk-Path Assessment

Under the No Action Alternative, pedestrian approaches to the Kennedy Center would remain as they are under existing conditions. Appendix A, Figure 4.3-1 (Pedestrian/Bicycle Routes - No Action) shows routes and the five-minute and 10-minute walking distances to the Kennedy Center. As shown on the map, access from the east and south is particularly poor. Because of the existing configuration of roadways, there are no direct paths from the southern or eastern portions of the study area to the Center. The existing walk paths are primarily confined to the sidewalks along the roadways of the study area.

None of the five selected points of origin (marked by stars on the map) is within a 10-minute walk of the Kennedy Center, with the partial exception of the north side of the Roosevelt Bridge. Walk times from the five origin points are summarized in Table 4.3-2.

Table 4.3-1
Crossing Characteristics at Seven Critical Intersections– No Action Alternative

Intersection	Acceptable ¹ Crossing Distance?	Curb-cut Present?	Crosswalk- Activated?	Crosswalk Illuminated?	Median/ Island ²	Countdown Signal Installed?	Crosswalk Safety?
Juarez Circle	No	Yes	Yes	Yes	I	No	Poor
Rock Creek Parkway/Virginia Avenue	No	Yes	Yes	Yes	I	No	Poor
E Street/23rd Street	No	Yes	Yes	Yes	A	No	Good
Constitution Avenue/23rd Street	No	Yes	Yes	Yes	No	No	Poor
Potomac Freeway/Ohio Drive	Yes	No	No	No	No	No	Very poor
F Street/Rock Creek Parkway	Yes	Yes	Yes	Yes	I	No	Fair
F Street at Kennedy Center	Yes	Yes	No	Yes	No	No	Fair
Note 1: A crossing distance of more than 50 feet wide without an adequate median is considered non-acceptable. 2 A= Adequate median; I = Inadequate median, not a safe haven. To provide a safe haven, a median must be at least 8 feet wide.							

Table 4.3-2
Walk Times to the Kennedy Center – No Action Alternative

Point of Origin	Walk Time (minutes)
Thompson's Boathouse	15.8
Foggy Bottom Metro Stop	17.6
Statue of Gálvez	16.2
Roosevelt Bridge	10.1
Lincoln Memorial	25.5

4.3.1.3 Alternative 4

Crossing Assessment

Under Alternative 4, the improvements to key intersections would include installation of countdown signals and crossing-activation devices (passive or active); relocation of crosswalks to minimize crossing distances; relocation of vehicle stop lines to ensure their proper alignment with respect to the relocated crosswalks; illumination of crosswalks where ambient light conditions warrant; and the

installation of auditory crosswalk indicators and curb cuts that are in compliance with Americans with Disabilities Act (ADA) requirements. Specific improvements would consist of the following:

- Modification or addition of adequate medians at Juarez Circle, Rock Creek Parkway/Virginia Avenue, Constitution Avenue/23rd Street, F Street/Rock Creek Parkway, and F Street at the Kennedy Center.
- Addition of countdown signals at Juarez Circle, Rock Creek Parkway/Virginia Avenue, E Street/23rd Street, Constitution Avenue/23rd Street, F Street/Rock Creek Parkway, and F Street at the Kennedy Center.
- Addition of an activated crosswalk at F Street at the Kennedy Center.

The addition/improvement of medians at F Street/Rock Creek Parkway and F Street at the Kennedy Center would improve crosswalk safety for these intersections. Because Alternative 4 would replace the existing stop-controlled, at-grade Potomac Freeway/Ohio Drive intersection with a pedestrian bridge parallel to the Roosevelt Bridge ramp over Potomac Freeway, the problems posed by that intersection would be eliminated. The deficiencies of the remaining intersections would be corrected. As a result, conditions under Alternatives 4 would be considerably better than conditions under the No Action Alternative. Table 4.3-3 summarizes the crossing characteristics of the seven critical intersections as they would be following implementation of Alternative 4. As a comparison of Table 4.3-3 with Table 4.3-1 makes clear, the impacts of Alternative 4 on crossings would be major and positive.

Walk-Path Assessment

Under Alternative 4, pedestrian access to the Kennedy Center would be improved in the following ways:

- Access from the west and Georgetown via Thompson's Boathouse would be made easier through construction of a better connection between the Georgetown Harbour trail and the Rock Creek Parkway trail.
- Access from the north and west via the Rock Creek Parkway trail would be made more direct by the construction of stairs connecting the trail to the west terrace of the Kennedy Center.
- Direct access from the east and downtown would be provided by the construction of the proposed new surface E Street and plaza.
- More direct access from the south and the National Mall would be provided by the construction of a new trail from the northwest corner of the intersection of Constitution Avenue and 23rd Street to the proposed plaza, along the westbound ramp to the Roosevelt Bridge.
- More direct access from the south side of the Roosevelt Bridge would be afforded by construction of a new trail and its connection to the Rock Creek Parkway trail.

Table 4.3-3
Crossing Characteristics at Seven Critical Intersections - Alternative 4

Intersection	Acceptable Crossing Distance?	Curb-cut Present?	Crosswalk-Activated?	Crosswalk Illuminated?	Median/ Island Present?	Countdown Signal Installed?	Crosswalk Safety
Juarez Circle	Yes	Yes	Yes	Yes	A ¹	Yes	Good
Rock Creek Parkway/Virginia Avenue	Yes	Yes	Yes	Yes	A ¹	Yes	Good
E Street/23rd Street	Yes	Yes	Yes	Yes	A ¹	Yes	Good
Constitution Avenue/23rd Street	Yes	Yes	Yes	Yes	A ¹	Yes	Good
Potomac Freeway/Ohio Drive ²	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F Street/Rock Creek Parkway	Yes	Yes	Yes	Yes	A ¹	Yes	Good
F Street at Kennedy Center	Yes	Yes	Yes	Yes	A ¹	Yes	Good
Note 1: A = Adequate							
Note 2: Under Alternative 4, this intersection would no longer exist.							

These improvements would have a positive impact on walk times to the Kennedy Center. Appendix A, Figure 4.3-2 (Pedestrian/Bicycle Routes - Action Alternatives 4 and 4V) shows the five-minute and 10-minute walking distances for Alternatives 4 and 4V. Walk times under Alternative 4 are summarized in Table 4.3-4, along with No Action walking times, for purpose of comparison.

Table 4.3-4
Walk Times to the Kennedy Center – Alternative 4

Point of Origin	Walk Times (minutes)		
	Alternative 4	No Action Alternative	Reduction in Walk Time
Thompson's Boathouse	11.7	15.8	4.1
Foggy Bottom Metro Stop	17.5	17.6	0.1
Statue of Gálvez	12.0	16.2	4.2
Roosevelt Bridge	9.6	10.1	0.5
Lincoln Memorial	16.1	25.5	9.4

Under Alternative 4, walk times from the five selected points of origin would be slightly to considerably better than under the No Action Alternative. As can be seen in the table, although the

reduction in walk time from the Foggy Bottom Metro Stop would be almost negligible, and that from the Roosevelt Bridge would be only half a minute, walk times from the other points of origin would be reduced by several minutes.

From Thompson's Boathouse and the Gálvez statue, walk times would be reduced by more than 25%, and from the Lincoln Memorial, by more than a third. Access from Georgetown via Thompson's Boathouse would improve due to the creation of a direct access point from the riverfront to the Kennedy Center. Walk time from the Lincoln Memorial and the Mall would also be greatly improved due to the creation of a new trail in the South Sector between Constitution Avenue and the proposed plaza. Appendix A, Figure 4.3-2 provides a visualization of these improvements.

4.3.1.4 Alternative 4V

Crossing Assessment

The impacts of Alternative 4V on crossings would be the same as those of Alternative 4, as described in Subchapter 4.3.1.3, with one difference: under Alternative 4V, the Potomac Freeway/Ohio Drive at-grade crossing would remain. However, this crossing would likely no longer be used, as pedestrians could now use the new trail and bridge. Should the existing crossing be maintained, it would be improved. Therefore, the impacts of Alternative 4V on pedestrian crossing would be major and positive.

Walk-Path Assessment

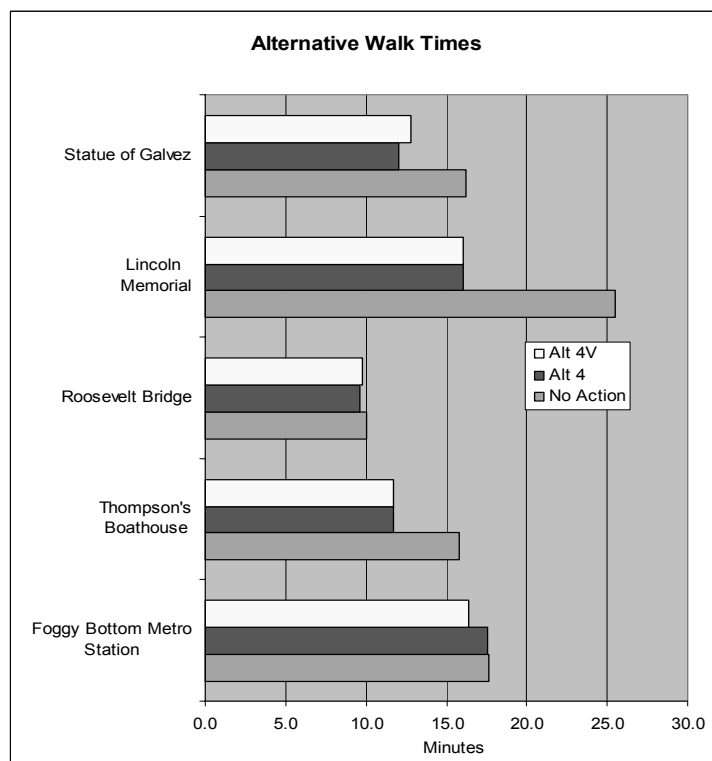
Improvements to pedestrians pathways and walk times to the Kennedy Center under Alternative 4V would be similar to those under Alternative 4, with substantial reductions in walk times from three of the points of origin – identical reductions in the case of Thompson's Boathouse and the Lincoln Memorial; an only slightly-less-substantial one in the case of the Gálvez statue – and modest reductions in the other two, as can be seen in Appendix A, Figure 4.3-2 and in Table 4.3-5 below.

Table 4.3-5
Walk Times to the Kennedy Center – Alternative 4V

Point of Origin	Walk Times (minutes)		
	Alternative 4V	No Action Alternative	Reduction in Walk Time
Thompson's Boathouse	11.7	15.8	4.1
Foggy Bottom Metro Stop	16.4	17.6	1.2
Statue of Gálvez	12.8	16.2	3.4
Roosevelt Bridge	9.8	10.1	0.3
Lincoln Memorial	16.1	25.5	9.4

The bar chart below provides a graphic summary of walk-time estimates for each of the alternatives. Either of the action alternatives would be an improvement over No Action conditions. Alternative 4 has a marginal walk-time advantage for access from the east (the Bernardo de Gálvez Statue), while

4V is slightly better for access from the Foggy Bottom Metro Station due to the configuration of the proposed plaza. Overall, however, the two action alternatives are functionally equivalent.



4.3.2 Bicycle Access

Bicycle-access impacts were assessed using a similar approach to that used for pedestrian access. The same five points of origin were used to assess travel times to the Kennedy Center, with an assumed speed of 11 miles per hour, including estimated wait times at signalized intersections.

4.3.2.1 No Action Alternative

No specific improvements to bicycle access in the study area are currently being proposed and no such improvements are known that depend on the proposed action for their completion. Therefore, the No Action would not have any negative impact on bicycle circulation in the area.

Travel times to the Kennedy Center from the selected study-area points of origin would remain similar to existing travel times. Table 4.3-6 summarizes these travel times.

Table 4.3-6
Bicycle Travel Times to the Kennedy Center – No Action Alternative

Point of Origin	Riding Time (minutes)
Thompson's Boathouse	4.2
Foggy Bottom Metro Stop	5.9
Statue of Gálvez	4.2
Roosevelt Bridge	2.5
Lincoln Memorial	7.2

4.3.2.2 Alternative 4

Under Alternative 4, bicyclists would benefit from the improvements made to pedestrian facilities, insofar as they make use of them. In particular, the provision of a new route in the South Sector between the south side of the Roosevelt Bridge and Constitution Avenue and the elimination of the crossing of the Potomac Freeway/Ohio Drive intersection would have a positive impact on safety. A new route would be provided by the trail that would extend from the northwest corner of the Constitution Avenue/23rd Street intersection to the plaza, along the westbound ramp to the Roosevelt Bridge.

As a result of the improvements proposed under Alternative 4, although travel times to the Kennedy Center would remain largely the same in the case of travel from three of the five points of origin, they would be greatly reduced in the case of travel from the remaining two, as shown in Table 4.3-7. Travel time from Thompson's Boathouse would be reduced by 45 percent, and the new trail to the proposed plaza would shorten travel time from the Lincoln Memorial and the Mall by 40 percent. Moreover, this analysis underestimates the positive effects of Alternative 4, as it does not take into account higher link speeds that could result from improvements in traffic flow.

Table 4.3-7
Bicycle Travel Times to the Kennedy Center – Alternative 4

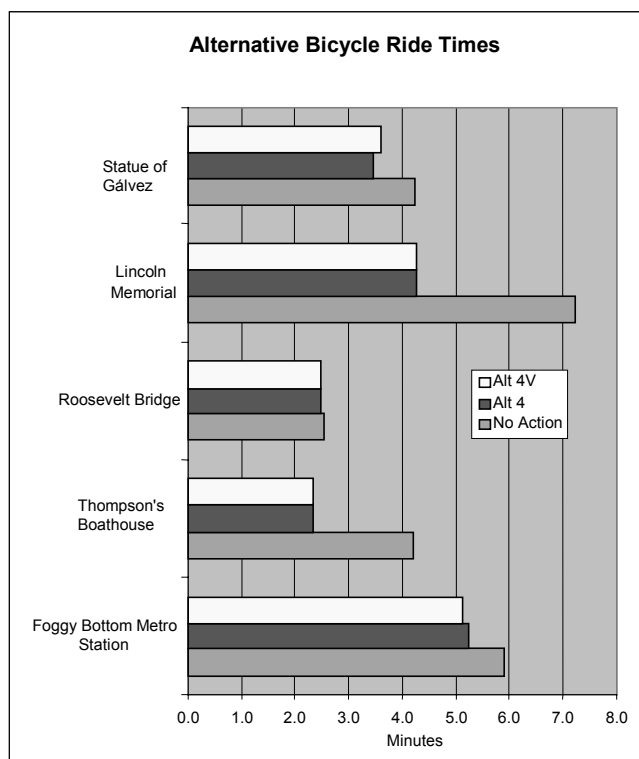
Point of Origin	Riding Time (minutes)		
	Alternative 4	No Action Alternative	Reduction in Travel Time
Thompson's Boathouse	2.3	4.2	1.9
Foggy Bottom Metro Stop	5.3	5.9	0.6
Statue of Gálvez	3.5	4.2	0.7
Roosevelt Bridge	2.5	2.5	0.0
Lincoln Memorial	4.3	7.2	2.9

4.3.2.3 Alternative 4V

The impacts of Alternative 4V on bicycle access would be similar to those of Alternative 4. Despite variations in plaza and roadway configurations, travel-time reductions are virtually identical to those of Alternative 4, as shown in Table 4.3-8, and graphically illustrated in the bar chart below.

Table 4.3-8
Bicycle Travel Times to the Kennedy Center – Alternative 4V

Point of Origin	Riding Time (minutes)		
	Alternative 4V	No Action Alternative	Reduction in Travel Time
Thompson's Boathouse	2.3	4.2	1.9
Foggy Bottom Metro Stop	5.1	5.9	0.8
Statue of Gálvez	3.6	4.2	0.6
Roosevelt Bridge	2.5	2.5	0
Lincoln Memorial	4.3	7.2	2.9



4.3.3 Vehicular Access

4.3.3.1 No Action Alternative

Major Approach Routes to the Kennedy Center

Under the No Action Alternative, there would be no changes to major approach routes to the Kennedy Center as described in Subchapter 3.3.3.1. This Alternative would have no impacts on those routes.

Major Highways and Streets

The No Action Alternative would not result in changes to any of the highways and streets within the study area. It would have no impacts on those highways and streets.

Traffic Analysis

Levels of Service

A traffic analysis was performed for the impact horizon year (2025) under No Action Alternative conditions to provide a baseline against which to compare the impacts of the two action alternatives.

Changes in levels of service (LOS) at study-area intersections were calculated for the year 2025 assuming a growth in traffic of 0.5 percent per year – the growth factor used by the District of Columbia Department of Transportation for traffic projections. For the purpose of this analysis, this 0.5 percent growth factor is assumed to account for both regional and local growth in traffic through the study area.

Figures F-9 (No Action Year 2025 Conditions AM Peak Hour Traffic Volumes) and F-10 (No Action Year 2025 Conditions PM Peak Hour Traffic Volumes) in Appendix F show predicted traffic volumes for the AM and PM peak periods under No Action Alternative conditions at the 20 study-area intersections for which AM and PM peak period volumes were recorded for the existing conditions study (see Subchapter 3.3.3.3). LOS are summarized in Appendix F, Table F-1, along with existing LOS for purposes of comparison. LOS D or better is considered acceptable for urban conditions. Noticeable degradation in service only occurs when LOS falls to E or F.

No Action Year 2025 AM and PM Peak Period LOS

Under the No Action Alternative, three of the 20 study-area intersections would operate at LOS E or worse in the AM peak period but at an acceptable LOS in the PM peak period:

- **27th Street and I Street:** This intersection operates at LOS F in the AM peak under existing conditions and would continue to do so under No Action conditions, due to the increase in traffic volumes expected to occur between now and 2025. Southbound 27th Street traffic from northbound Potomac Freeway would share green time with eastbound I Street traffic from Southbound Rock Creek Parkway destined for southbound Potomac Freeway. The large traffic volumes for each of these movements

would continue to result in failure at this intersection during the AM peak period.

- **E Street Expressway (eastbound) and 20th Street:** This intersection operates at LOS E in the AM peak under existing conditions and would continue to do so under No Action conditions (2025). Heavy northbound through traffic along 20th Street would conflict with eastbound E Street Expressway traffic turning left onto northbound 20th Street or continuing eastbound through the intersection.
- **Ramp off E Street Expressway (eastbound) and Virginia Avenue:** The increase in traffic volumes would push this intersection to an unacceptable LOS E during the AM peak period (under existing conditions, the AM peak LOS is B). The large volume of left-turning traffic from the Ramp to northbound Virginia Avenue in the AM peak period would cause unacceptable delays at this intersection. The PM peak period would continue to operate at an acceptable LOS.

As they do under existing conditions, four of the 20 study-area intersections would operate at LOS E or worse during both the AM and PM peak periods:

- **K Street/Whitehurst Freeway and 27th Street:** As is to be expected, the increase in traffic volumes at this intersection in 2025 would mean that the existing LOS F during the AM and PM peak periods would persist. The western approach to this intersection has to accommodate both upper (Whitehurst Freeway) and lower (K Street) roadway traffic, which would require two separate signal phases for this leg alone. The lengthy green time required for the west leg would result in minimal green time for the heavy traffic movements required on the east and south legs.
- **Constitution Avenue Intersections with Henry Bacon Drive, 22nd Street, and 23rd Street.** As is to be expected, the increase in traffic volumes at these intersections in 2025 would result in a degradation of AM peak LOS to F (from LOS E under existing conditions) and a continuing PM peak LOS F (also F under existing conditions). Taken together, these closely spaced, signalized intersections would operate at LOS F in the AM and PM peak periods. In the AM period, high traffic volumes approaching from the west along I-66 and the Roosevelt Bridge would flow freely to the west leg of the intersection with 23rd Street, causing lengthy queuing. Insufficient green time would cause a severe breakdown for eastbound Constitution Avenue traffic. In the PM peak period, the main traffic flow would be westbound along Constitution Avenue toward the Roosevelt Bridge and I-66. At 23rd Street, this westbound traffic would conflict with heavy southbound 23rd Street traffic destined for Memorial Bridge. The observed contributing conditions to poor operating efficiency (described in Subchapter 3.3.3.3) would continue.

No Action Year 2025 Pre-Performance LOS

Figure F-11 (No Action Year 2025 Conditions Pre-Performance Peak) in Appendix F shows projected traffic volumes and LOS during the pre-performance peak period for the 23 study-area intersections for which traffic volumes were recorded for the existing conditions study (see Subchapter 3.3.3.3). Table F-2 in Appendix F provides a summary of the pre-performance peak LOS for each of these intersections, along with existing conditions pre-performance LOS for purposes of comparison. As can be seen in Table F-2, 15 of the 23 intersections studied would

operate at LOS D or better, indicating acceptable operating efficiency through the intersections. Under existing conditions, 16 intersections operate at LOS D or better.

Eight of the 23 intersections would operate at LOS F during the pre-performance peak period. Of these, seven already experience LOS F:

- **Rock Creek Parkway and Virginia Avenue:** The projected increase in traffic volumes at this intersection would result in LOS F in the pre-performance period, as existing volumes do today. Major delays and poor operating conditions would thus continue to occur at this intersection. The high-volume left-turn movement from southbound Rock Creek Parkway to Virginia Avenue would conflict with extended peak-period traffic traveling northbound on Rock Creek Parkway through the intersection, causing extensive delays.
- **K Street/Whitehurst Freeway and 27th Street:** The projected increase in traffic volumes at this intersection would result in LOS F in the pre-performance period, as existing volumes do today. Heavy PM peak volumes would continue to carry over into the pre-performance time period, resulting in many of the same problems that would occur during the PM peak. Although pre-performance volumes would be lower than PM peak volumes, the intersection would still be unable to accommodate the volume of traffic entering and exiting it.
- **Constitution Avenue Intersections with Henry Bacon Drive, 22nd Street, and 23rd Street:** The projected increase in traffic volumes at this intersection would result in a pre-performance LOS F, as existing volumes do today. This situation would be a continuation of the conditions described above for the PM peak period.
- **Ohio Drive and Potomac Freeway:** The projected increase in traffic volumes at this intersection would result in pre-performance LOS F, as existing volumes do today. Although all conflicting movements at this intersection would continue to be eliminated during the PM peak (5:15 - 6:15 pm), during which Ohio Drive would continue to operate as a one-way route, shortly after Ohio Drive is returned to two-way operation major delays and poor operating conditions would occur, as can be observed under existing conditions. The pre-performance peak falls within this period of resumed two-way operation. The high volume of traffic from the Roosevelt Bridge to southbound Independence Avenue would conflict with extended peak-period traffic traveling northbound on Ohio Drive to Rock Creek Parkway through the intersection with Potomac Freeway, causing extensive delays. The queuing and delays would be caused primarily by vehicles from the bridge that must stop and wait for gaps in the northbound Ohio Drive traffic stream to make a left turn onto southbound Ohio Drive. Poor sight distances, tight horizontal curves, and speeding would continue to contribute to the difficulty for left-turning vehicles.
- **Ohio Drive and Rock Creek Parkway:** The projected increase in traffic volumes at this intersection would result in pre-performance LOS F, as existing volumes do today. This intersection would continue to be stop-controlled. In the northbound Rock Creek Parkway movement from Lincoln Circle, vehicles would be required to stop, while the Ohio Drive/Rock Creek Parkway movement would be uncontrolled. Heavy northbound Rock Creek Parkway/Ohio Drive traffic that extends beyond the rush-hour period

combined with southbound Rock Creek Parkway/Ohio Drive traffic would make it difficult for vehicles from Lincoln Circle to turn left onto northbound Rock Creek Parkway.

One intersection would degrade from an acceptable to an unacceptable pre-performance LOS:

- **F Street and 25th Street:** The increase in volumes traveling through this stop-controlled intersection would result in LOS F in 2025; existing pre-performance LOS is D. Each leg of the intersection would be stop-controlled, which would result in major delays to the higher-volume through movement along 25th Street.

Measures of Effectiveness

Measures of effectiveness (MOE) are explained in Subchapter 3.3.3.3. Table 4.3-9 shows MOE under 2025 No Action conditions for the AM peak period, with corresponding existing conditions MOE for purposes of comparison. Table 4.3-10 shows the same MOE for the PM peak period, and Table 4.3-11 for the pre-performance period.

Table 4.3-9
Measures of Effectiveness – No Action (2025) – AM Peak Period

MOE	Existing Conditions	No Action Alternative	Absolute Decrease in Effectiveness	Relative Decrease in Effectiveness
Total Signal Delay (hr)	428	713	285	67%
Total Travel Time (hr)	1,322	1,714	392	30%
Fuel Consumed (gal)	1,635	2,096	461	28%
Queuing Penalty (veh)	6,117	7,714	1,597	26%
Distance Traveled (mi)	26,344	29,505	3,161	12%
Stops	44,765	67,862	23,097	52%

As can be seen in Table 4.3-9, AM peak MOE under the No Action Alternative would be appreciably worse than existing conditions on all measures. In 2025, the total distance traveled by all drivers during the AM peak on a typical day would represent an increase of 3,161 miles (12 percent) per day over the total distance traveled under existing conditions; the number of vehicles queuing would have increased by 26 percent; 28 percent more fuel would be being consumed; total travel time would have increased by 30 percent; the number of stops made by all vehicles would have increased by 52 percent; and the total time spent as a result of signal delays would have increased by 67 percent.

This major decline in relative effectiveness would follow from the increase in traffic volumes expected to occur between now and 2025. For drivers to have to spend considerably more time in their vehicles waiting on queues, waiting for signals to change and stopping, and traveling farther and consuming more fuel in the process, suggests increases in lost time and productivity and in vehicle operating costs, all of which may be considered adverse socioeconomic impacts. Increase in

the general level of frustration typically experienced in urban rush-hour travel may also be factored in as an adverse consequence of this increase in the unpleasantness of the morning commute.

Table 4.3-10
Measures of Effectiveness – No Action (2025) – PM Peak Period

MOE	Existing Conditions	No Action Alternative	Absolute Decrease in Effectiveness	Relative Decrease in Effectiveness
Total Signal Delay (hr)	276	392	116	42%
Total Travel Time (hr)	1,030	1,237	207	20%
Fuel Consumed (gal)	1,349	1,589	240	18%
Queuing Penalty (veh)	5,503	7,041	1,538	28%
Distance Traveled (mi)	22,623	25,339	2,716	12%
Stops	38,924	46,757	7,833	20%

PM peak-period MOE under the No Action Alternative would also be considerably worse than under existing conditions, again reflecting the expected increase in traffic volumes between now and 2025. As can be seen in Table 4.3-10, however, the PM peak-period MOE declines would not be as severe as those experienced in the AM peak. Although the increase in distance traveled (measured as a percentage) would be identical to that experienced in the AM peak, and the increase in queuing time nearly so, on the other four measures the reductions in effectiveness are somewhat less salient. Nevertheless, they would again represent major increases in time spent in vehicles, distances traveled, and fuel consumed, and thereby potential losses in productivity, increased expenses, and a general increase in commuter frustration levels.

Table 4.3-11
Measures of Effectiveness – No Action (2025) – Pre-performance Period

MOE	Existing Conditions	No Action Alternative	Absolute Decrease in Effectiveness	Relative Decrease in Effectiveness
Total Signal Delay (hr)	600	3,938	3,338	565%
Total Travel Time (hr)	1,269	4,687	3,418	269%
Fuel Consumed (gal)	1,748	4,643	2,895	166%
Queuing Penalty (veh)	6,143	8,820	2,677	44%
Distance Traveled (mi)	23,328	26,128	2,800	12%
Stops	55,696	101,243	45,547	82%

As is clear from Table 4.3-11, by the year 2025, pre-performance MOE under the No Action Alternative would be considerably worse than under existing conditions. Although AM period and PM period MOE would also deteriorate considerably, the deterioration of the pre-performance MOE is much more substantial, with a fivefold-plus increase in the time consumed in signal delays,

a twofold-plus increase in total travel time, and a 166% increase in fuel consumption. The severe deterioration in these three measures, and the smaller though still-serious decline in effectiveness on the other three reflects the return of the network to normal operating conditions once the PM-peak circulation patterns, which favor outbound traffic, are ended, while substantial outbound traffic still must make its way through the area. For Kennedy Center as well as regular commuters caught in the post-PM-peak circulation pattern, the nearly threefold increase in travel time could be expected to greatly exacerbate the frustration of driving.

In summary, as evidenced by Tables 4.3-9 through 4.3-11, the overall effectiveness of the transportation network in the study area is expected to deteriorate considerably under No Action conditions, with severe degradation on individual measures at certain times. Deterioration would be most pronounced, and therefore most noticeable, during the pre-performance period.

4.3.3.2 Alternative 4

Major Approach Routes to the Kennedy Center

Under Alternative 4, existing major access routes to the Kennedy Center (described in Subchapter 3.3.3.1) would be maintained and improved. A new major access route would be created from the east, via a new upper level E Street and the proposed plaza. Impacts on vehicular access routes to the Kennedy Center would be substantial and positive.

Theodore Roosevelt Bridge

Under Alternative 4, the Theodore Roosevelt Bridge would remain a major access route to the Kennedy Center via Rock Creek Parkway. The proposed improvements in the South Sector would have a substantial positive impact on this route. The grade separation between the Potomac Freeway and Ohio Drive, along with the realignment of Ramp RP-5 (ramp numbers are shown in Appendix A, Figure 3.3-2) and the creation of a dedicated lane to southbound Ohio Drive toward the Rock Creek Parkway and the Kennedy Center, would eliminate the queues that presently form on Ramp RP-5 during pre-performance times because of the unsafe stop-controlled intersection at the bottom of the ramp at Ohio Drive.

The proposed grade separation would eliminate the stop-controlled intersection and provide a free-flow traffic movement from RP-5 to southbound Ohio Drive. Traffic from RP-5 bound for the Kennedy Center via Rock Creek Parkway would be provided with a dedicated lane for travel northbound on Ohio Drive. Additionally, ramp traffic bound for the Center would no longer be blocked by vehicles queued at the stop sign waiting for gaps in the traffic along Ohio Drive and would be free-flowing at all times. As a result, the few patrons currently reaching the Kennedy Center from Roosevelt Bridge via the Potomac Freeway and 27th Street would likely instead use Ohio Drive and the parkway.

Rock Creek Parkway

Under Alternative 4, the Rock Creek Parkway southbound would continue to be a major access route to the Kennedy Center. Patrons could continue to reach the Center from the north by turning from the parkway onto Virginia Avenue. From Virginia Avenue, drivers could then reach the Center

via either New Hampshire Avenue or extended 25th Street and the new plaza. The proposed improvements to the connection between the parkway, Virginia Avenue, 27th Street, and the Potomac Freeway would have a positive effect on this route because they would improve traffic flow from the parkway onto Virginia Avenue.

Additionally, the existing signalized intersection at F Street and a proposed new signalized intersection at the south garage entrance would provide left-turn phases to allow access from southbound Rock Creek parkway to the Kennedy Center garages.

South of the Kennedy Center, northbound Rock Creek Parkway would continue to be a major access route for patrons approaching from Virginia and from Independence Avenue. Access via this route would be substantially improved by the proposed grade separation of the Potomac Freeway/Ohio Drive intersection.

New Hampshire Avenue

Under Alternative 4, New Hampshire Avenue would continue to serve as a major approach route from the north and northeast. From Juarez Circle, patrons could approach the Kennedy Center by either staying on the Avenue to F Street, or turning onto 25th Street to the new plaza.

Virginia Avenue

As indicated above, under Alternative 4, Virginia Avenue west of Juarez Circle would continue to serve patrons reaching the Kennedy Center via Rock Creek Parkway. East of Juarez Circle, Virginia Avenue likely would be replaced as an approach route from the east by the new, decked E Street. Traffic on Virginia Avenue between Rock Creek Parkway and 27th Street would be considerably reduced by the new direct connection between the Potomac Freeway and Rock Creek Parkway. This would substantially improve access to the Kennedy Center from K Street and Rock Creek Parkway.

Ohio Drive

Under Alternative 4, Ohio Drive would continue to provide access to the Kennedy Center from Independence Avenue and beyond via Rock Creek Parkway. Access via this route would be substantially improved by the proposed grade separation of the Potomac Freeway/Ohio Drive intersection. As a result, the few patrons currently reaching the Center from Ohio Drive via the Potomac Freeway and 27th Street would likely continue to use Ohio Drive to Rock Creek Parkway.

27th Street

Under Alternative 4, 27th Street would continue to be used by patrons approaching the Kennedy Center from K Street/Whitehurst Freeway. From 27th Street, patrons would continue onto Virginia Avenue to the Center, as they currently do. The proposed improvements to the intersection of 27th Street, Virginia Avenue, and Rock Creek Parkway would have a positive impact on this route, as Potomac Freeway traffic destined for northbound Rock Creek Parkway would now use the new northbound ramp, avoiding 27th Street entirely. The proposed improvements in the South Sector may also cause some patrons using 27th Street from northbound Potomac Freeway to stop doing so, as the approach via Ohio Drive and the Rock Creek Parkway would become more attractive.

E Street

Under Alternative 4, E Street would be decked and provide at-grade access to the Kennedy Center via the proposed plaza. This access route currently is not available, and its creation would represent a major positive impact on access to the Center. The new route would likely mostly serve patrons approaching the Center from the east and downtown Washington, as well as these patrons approaching it from Lincoln circle via 23rd Street. At present, this traffic uses Virginia Avenue to reach the Center. The new access route would result in less traffic on the avenue and Juarez Circle.

Major Highways and Streets

Alternative 4 would result in substantial changes to several roads and streets within the study area. The impacts of these changes would be positive, as they would improve the efficiency of the road network and result in easier and generally faster travel to and from the Kennedy Center, as well as through the study area.

Theodore Roosevelt Bridge and Ramps

No changes to the main span of the Theodore Roosevelt Bridge are proposed under Alternative 4. Some of the ramps linking the bridge to the District's road network would be affected. No movements would be eliminated. Ramp RP-6 (ramp numbers are shown in Appendix A, Figure 3.3-2), connecting the inbound bridge to the E Street Expressway eastbound and the Potomac Freeway northbound (via ramp RP-12) would be rebuilt to connect to the lowered freeway under the proposed deck. Ramp RP-13 (southbound Potomac Freeway to eastbound E Street Expressway) would be eliminated, resulting in a major improvement to traffic flow along Ramp RP-6 (inbound Roosevelt Bridge to eastbound E Street Expressway). Currently, the three eastbound E Street Expressway travel lanes are fed by one lane each from ramps RP-6, RP-8 and RP-13. Currently, ramp RP-6 consists of two travel lanes that must merge into one lane before joining the expressway. Eliminating ramp RP-13 would make it possible to allow both lanes of RP-6 to continue onto the E Street Expressway, eliminating the need to merge and thereby improving traffic flow.

Ramp RP-5, connecting the inbound bridge to southbound Potomac Freeway and Ohio Drive, would be rebuilt. The buttonhook linking the ramp to the parkway northbound and the Kennedy Center would be moved a short distance to the west of its current position. A dedicated lane would be provided, allowing traffic to enter the parkway without having to merge or be blocked by vehicles queuing at the stop-controlled intersection, as is currently the case. Back-ups that currently often extend onto the bridge would thus be eliminated.

Potomac Freeway

Alternative 4 would result in substantial physical changes to the Potomac Freeway throughout the study area. These changes, primarily in the North and South Sectors, would have the positive result of making this underutilized facility more attractive to commuters who now use the Rock Creek Parkway to reach Independence Avenue or the Roosevelt Bridge. Impacts on the freeway would thus be positive.

In the North Sector, the system of ramps that currently end the Potomac Freeway and connects it to nearby roads would be altered in the following manner (illustrated in Appendix A, Figure 4.3-3 [Alternative 4 - Rock Creek Parkway & Virginia Avenue Intersection]):

- Ramp RP-20, which presently carries two northbound freeway lanes to an intersection with 27th Street, would be modified by shifting the intersection with 27th Street to the north. Additionally, a new ramp would be built, branching off Ramp RP-20 and connecting it to the Rock Creek Parkway northbound, where a signalized intersection would control traffic movements. The new ramp would carry two lanes of northbound traffic and would merge with existing ramp RP-24 north of K Street. Ramp RP-24 currently connects westbound Whitehurst Freeway/K Street with the northbound parkway. This connection would be eliminated, and the portion of roadway between Whitehurst Freeway/K Street and the point where Ramp RP-24 would be joined by the new ramp from the northbound Potomac Freeway would be removed. Access from the Whitehurst Freeway/K Street to the northbound parkway would be through 27th Street and the proposed new connection described below. The primary purpose of the new ramp is twofold: to provide a direct connection between the northbound Potomac Freeway and northbound Rock Creek Parkway, and to reduce the traffic flowing through the congested intersection of Rock Creek Parkway and Virginia Avenue, thereby improving access for patrons of the Kennedy Center.
- A new connection would be built between the Rock Creek Parkway and the southbound Potomac Freeway south of K Street and north of Virginia Avenue. Between the parkway and 27th Street, the new connection would be two-way, with one lane traveling west from 27th Street southbound and two lanes traveling east towards Potomac Freeway. After crossing 27th Street, the two eastbound lanes would become two of the four southbound Potomac Freeway lanes. The creation of this new connection between the Rock Creek Parkway and the Potomac Freeway southbound would make possible the removal of the existing access ramp (I Street) from 27th Street to the southbound freeway, which is presently used by drivers who need to go from the southbound parkway to the southbound freeway. This would reduce the number of vehicles flowing through the congested intersection of Rock Creek Parkway and Virginia Avenue.

In the Center Sector, to accommodate the proposed deck east of the Kennedy Center, the Potomac Freeway would be lowered by up to 20 feet over approximately 2,000 feet between Juarez Circle and the Roosevelt Bridge interchange. About 800 feet of the freeway would be under the proposed deck.

Additionally, Ramp RP-13, which currently links the southbound freeway to eastbound E Street Expressway, would be eliminated. This movement would not be replaced, but impacts on the system's connectivity would be minor, as only 2,300 vehicles a day have been found to use the ramp. Ramp RP-10, which connects the expressway to the Roosevelt Bridge, would be reconstructed to accommodate the deck, as would Ramp RP-8, which connects the northbound freeway to the E Street Expressway eastbound. An exit ramp from the proposed parking garage under the deck would connect to the reconstructed ramp RP-10, providing direct access to the bridge westbound.

In the South Sector, the Potomac Freeway, after emerging from under the deck, would narrow to one lane and travel over Ohio Drive via a grade separation. Ohio Drive would be lowered, and a new elevated structure would carry the southbound freeway lane over to Ohio Drive southbound;

these improvements are indicated in Appendix A, Figure 4.3-4 (Alternative 4 - Potomac Freeway & Ohio Drive Intersection). For reasons of safety and geometry, the existing U-turn linking the southbound and northbound lanes of the freeway would be eliminated. Safer and more prudent means of accessing E Street and the Roosevelt Bridge would be available.

As a result of these improvements, the Potomac Freeway is expected to become much more attractive to commuters, resulting in less commuter traffic on the Rock Creek Parkway south of Virginia Avenue.

E Street Expressway

Alternative 4 would result in substantial physical changes to the E Street Expressway. The impacts of these changes would be either negligible or positive.

The E Street Expressway would be entirely decked between Virginia Avenue and the proposed plaza east of the Kennedy Center. To accommodate the deck, several ramps associated with the expressway would have to be rebuilt or removed. Ramp RP-11 (ramp numbers are shown in Appendix A, Figure 3.3-2), connecting the expressway to the Roosevelt Bridge westbound would be reconstructed, but the access it currently provides to the southbound Potomac Freeway via Ramp RP-9 would be eliminated. This movement would not be replaced, but the impacts its removal would have on the system's connectivity would be negligible, as only about 65 vehicles per day currently use ramp RP-9.

The access ramp leading from the westbound expressway to northbound Potomac Freeway (Ramp RP-14) would be realigned to accommodate the deck and the lowering of the freeway. Finally, the ramp currently linking the eastbound expressway to Virginia Avenue along the northern side of the State Department (Ramp RP-17) would also be eliminated. Expressway traffic bound for Virginia Avenue (3,900 vehicles a day) would have to stay on the expressway to 20th Street, where a right-turn movement to Virginia Avenue would be provided (see below, *20th Street*). To further mitigate the impact of eliminating Ramp RP-17, the expressway lane that currently provides dedicated access to the ramp would be continued east to 20th Street, adding a lane to the existing tunnel.

The elimination of Ramp RP-17 would have a positive impact on the State Department building, to which it is adjacent and for which it represents a potential security risk.

E Street

Currently, E Street west of Virginia Avenue exists as a side street that terminates into a ramp to the northbound Potomac Freeway (Ramp RP-15). Under Alternative 4, this section of E Street would be recreated as a full-fledged city street on the deck over the E Street Expressway. The new surface E Street would have sidewalks on each side and two lanes of traffic in each direction, separated by a landscaped median. On the west, it would terminate at the new plaza and connect with extended 25th Street. Beyond 25th Street, the new E Street lanes would ring the plaza, with a connection to the garage access road on the south side. East of 23rd Street, E Street would terminate at Virginia Avenue, across which it would functionally and visually merge with the existing E Street, thus connecting the new plaza and the Kennedy Center to the downtown street grid.

As part of the re-creation of E Street, Ramp RP-15 would be eliminated and access to the Potomac Freeway would be from the E Street Expressway only. The impacts on traffic and connectivity from eliminating this movement would be minor, as only 465 vehicles a day have been found to use ramp RP-15. These vehicles would have to use the expressway to access the Potomac Freeway.

The impacts of the proposed changes on E Street would be positive.

20th Street

Presently, 20th Street between Virginia Avenue and the eastbound lanes of the E Street Expressway is a four-lane, one-way northbound facility. Under Alternative 4, in order to provide access from the expressway to Virginia Avenue, that portion of 20th Street would be modified to accommodate a southbound movement and a dedicated right-turn lane onto Virginia Avenue. This new movement would mitigate the impacts of eliminating Ramp RP-17, currently providing access from eastbound E Street Expressway to Virginia Avenue.

Rock Creek Parkway

Under Alternative 4, physical changes to the Rock Creek Parkway would only occur in the North Sector of the study area. The current intersection between the northbound lanes of the parkway and Ramp RP-24 from Whitehurst Freeway/K Street would be upgraded and widened as ramp RP-24 is turned into the northern end of the new ramp linking the northbound Potomac Freeway to the parkway. This new intersection would be signalized, and the existing concrete median along Rock Creek Parkway would be extended north beyond the new intersection.

Additionally, a new road connecting Rock Creek Parkway with 27th Street and southbound Potomac Freeway would be constructed between K Street and Virginia Avenue. The intersection of the new connector road with the parkway would be signalized. To allow for left turns from the southbound lanes of the parkway to the new connector road, a segment of the existing raised median would have to be removed.

The new connections between the parkway and the Potomac Freeway in the north, and between the Potomac Freeway and Ohio Drive in the south, are expected to make the freeway a more attractive option for commuters. As a result, the parkway between Virginia Avenue and Ohio Drive (at the Belvedere) would experience less heavy traffic volumes. The impacts of the proposed changes on the parkway would be positive because they would improve its connections with the surrounding road network, and, south of Virginia Avenue, return the parkway to traffic volumes more in keeping with its parkway status. Shifting much of the heavy northbound parkway traffic to the Potomac Freeway would allow for the creation of a new signalized left-turn movement from southbound Rock Creek Parkway into the Kennedy Center south garage entrance. In addition, the signalized intersection at Rock Creek Parkway and F Street would also provide a left-turn movement.

Ohio Drive

Alternative 4 would result in substantial physical changes to the portion of Ohio Drive between the ramp linking it to Lincoln Circle and the Rock Creek Parkway. To improve the intersection with the southbound Potomac Freeway, Ohio Drive would be lowered so as to pass under the freeway,

allowing for free-flowing traffic at all times. In conjunction with the shifting to the west of Ramp RP-5 from the Roosevelt Bridge, this change would solve the functional and safety problems that characterize this intersection presently. The impacts of the proposed changes on Ohio Drive would therefore be positive.

Virginia Avenue

Under Alternative 4, the intersection of Virginia Avenue with E Street would be rebuilt to accommodate the new extended upper-level E Street. Also, the existing intersection with Ramp RP-17 from eastbound E Street Expressway and D Street would be removed. There would be no other physical change to Virginia Avenue.

Near the Rock Creek Parkway, Virginia Avenue would benefit from the improvement proposed for the intersection with 27th Street, the Rock Creek Parkway, and the Potomac Freeway. Overall, impacts on Virginia Avenue would be negligible or positive.

New Hampshire Avenue

There would be no changes to New Hampshire Avenue under Alternative 4.

Constitution Avenue

There would be no changes to Constitution Avenue under Alternative 4.

27th Street

Under Alternative 4, a new connection would be established across 27th Street between the Rock Creek Parkway and southbound Potomac Freeway. A new signalized intersection would be created and combined with the realigned intersection of 27th Street with the ramp off the northbound Potomac Freeway. The purpose and principal impact of these changes would be to improve the connection between 27th Street, the Rock Creek Parkway, the Potomac Freeway, and Virginia Avenue, as described below. As part of the proposed changes, the entire length of 27th Street between K Street and Virginia Avenue would be rebuilt and provided with sidewalks.

Rock Creek Parkway/Virginia Avenue/I Street/27th Street Intersection

Changes proposed for the North Sector of the study area under Alternative 4 have as their main purpose the improvement of this intersection. In addition to the changes described under *Potomac Freeway* and *Rock Creek Parkway*, Alternative 4 would affect the intersection by eliminating the existing access from 27th Street to the southbound Potomac Freeway via I Street/Ramp RP-18. I Street would become a dead-end street serving the three houses standing at its northeastern corner with 27th Street. The proposed changes are shown in Appendix A, Figure 4.3-3, along with allowed traffic movements during the off-peak, AM, and PM peak periods.

25th Street

Under Alternative 4, 25th Street would be realigned and extended south of F Street to an intersection

with the new E Street on the proposed plaza. The extended 25th street would carry one lane in each direction, with a reversible center lane for pre- and post-performance periods. This section of 25th Street would have sidewalks on either side. Impacts on 25th Street and the road network would be positive, as the proposed change would recreate links with the rest of the downtown street grid.

F Street

A left-turn movement from southbound Rock Creek Parkway to northbound F Street would be created to allow access to the Kennedy Center garage entrance. This left-turn movement would be made possible by shifting much of the northbound Rock Creek Parkway traffic onto the Potomac Freeway, thereby minimizing opposing traffic volumes for left-turning vehicles.

Traffic Analysis

Levels of Service (LOS)

To assess the impact of Alternative 4 on LOS, the number of additional vehicular trips likely to be generated by the proposed action was calculated, based on the expected number of additional Kennedy Center employees, visitors, performers, and patrons. This number was determined based on the size of the facilities proposed and the projected activity levels. Estimates were calculated for two typical days – a Thursday and a Saturday, typically the busiest days at the Kennedy Center – for the AM (8:00 to 9:00) and PM (5:15 to 6:15) peak periods, as well as for the pre-performance peak (6:30 PM to 7:30 PM).

Rounding up the numbers, the net increase in traffic during the AM peak was estimated to be 280 car trips on Thursdays and 20 on Saturdays. PM peak increases would be about 80 trips on Thursdays and 90 on Saturdays. Pre-performance trips would increase by about 210 on Thursdays and 220 on Saturdays. Post-performance peak-period trips would increase by about 510 for Thursdays and 360 for Saturdays.

These additional trips were added to the background growth expected to occur between now and the 2025 horizon (as indicated under the No Action Alternative, the rate of increase used was 0.5 percent per year) to calculate the total amount of traffic expected to travel through the study area under Alternative 4.

The total number of trips was then distributed across the road network as it would be following implementation of Alternative 4, based on expected uses for each access route. Because of the proposed changes to the road network in the study area, the distribution of traffic on the network was adapted to reflect likely changes in itineraries.

Alternative 4 Year 2025 AM and PM Peak Period LOS

Predicted traffic volumes are shown in Figures F-12 (Year 2025 AM Peak Hour Traffic Volumes Alternative 4) and F-13 (Year 2025 PM Peak Hour Traffic Volumes Alternative 4), in Appendix F, along with LOS calculated on the basis of these volumes for AM and PM peak periods. Table F-3 in Appendix F presents the results in summary form.

Under Alternative 4, three of the 20 study intersections would be eliminated, one would be considerably modified, and three new intersections would be created. LOS for the 16 existing intersections that would be maintained under Alternative 4 would be better or similar to what they would be under the No Action Alternative. No change from an acceptable (A to D) to an unacceptable (E or F) LOS would occur.

Under No Action conditions, two of the intersections that would be eliminated under Alternative 4 would have unacceptable LOS during either the AM or PM peak period, or both, so their elimination would have a positive impact on the transportation network. These intersections are:

- **27th Street and I Street:** The proposed new connections between the Potomac Freeway and Rock Creek Parkway eliminate the need for this intersection, which was projected to operate at LOS F in the AM peak under No Action conditions.
- **Ramp off E Street Expressway (eastbound) and Virginia Avenue:** Under No Action conditions, this intersection would operate at LOS E in the AM peak period. Elimination of this intersection under Alternative 4 would result in vehicles continuing on the E Street Expressway to 20th Street (acceptable LOS C in the AM peak and A in the PM peak) then turn right to reach Virginia Avenue via 20th Street (acceptable LOS C in the AM and PM peak periods). The impact to the 20th Street/E Street intersection would be minimized by the addition of a free-flow right-turn lane.

The third intersection that would be eliminated under Alternative 4 is that of **Ramp RP-24 (from K Street/Whitehurst Freeway) and Rock Creek Parkway (northbound)**. This intersection would operate at an acceptable LOS C in the PM peak under No Action conditions (it would be closed in the AM peak, when all parkway lanes are southbound), but it would remain underutilized and unsafe, as it is today, due to the lack of an acceleration lane and poor sight distance. Elimination of this intersection and its replacement with a new intersection with a ramp from the northbound Potomac Freeway would contribute to improving operations within the study area.

Under Alternative 4, the at-grade, stop-controlled intersection between the **southbound Potomac Freeway and Ohio Drive** would be considerably modified, as it would be replaced by a grade-separated, free-flowing intersection. Operations at the existing intersection are characterized by free-flow conditions during both the morning and evening peak periods. Positive impacts on pre-performance operations would result, as described below.

Under Alternative 4, three new intersections would be created:

- **New ramp from northbound Potomac Freeway and northbound Rock Creek Parkway.** This intersection would replace that of Ramp RP-24 with the parkway, and would be signalized. In the AM peak, when all parkway lanes are southbound, it would be closed. In the PM peak, it would operate at an acceptable LOS C. The creation of this new connection and intersection would contribute to diverting a large amount of traffic from the Virginia Avenue/Rock Creek Parkway intersection and the Virginia Avenue/27th Street intersection, thereby improving operations of these intersections during all periods.
- **Intersection of Rock Creek Parkway with new ramp to southbound Potomac Freeway AND Intersection of 27th Street with new ramp between Rock Creek**

Parkway and southbound Potomac Freeway: These new intersections are necessary to control movements to and from the new connection road and Rock Creek Parkway, 27th Street, and the Potomac Freeway. This proposed new connection would divert a large amount of traffic from the Virginia Avenue/Rock Creek Parkway intersection, thus improving operating conditions at this currently congested intersection and improve access to the Kennedy Center. In the AM and PM peak, the intersection of the Rock Creek Parkway with the proposed connector roadway to the Potomac Freeway would be freely flowing. The intersection of 27th Street with new ramp between Rock Creek Parkway and southbound Potomac Freeway would operate at acceptable LOS D in the AM peak and C in the PM peak.

Taken as a whole, the impacts of Alternative 4 on AM and PM peak traffic in the study area would be positive.

Alternative 4 Year 2025 Pre-Performance Period LOS

Predicted traffic volumes are shown in Appendix F, Figure F-14 (Year 2025 Pre-performance Peak Hour Traffic Volumes Alternative 4) along with LOS calculated on the basis of these volumes for the pre-performance period (6:30 PM to 7:30 PM). Results are summarized in Table F-4 in Appendix F.

Under Alternative 4 during the pre-performance time period, operations would be considerably better than under No Action conditions at three intersections:

- **Ohio Drive and Rock Creek Parkway** (LOS B instead of F). This improvement would result from the considerably smaller volumes of traffic traveling through the intersection northbound from Ohio Drive (1,850 vehicles under No Action; 830 under Alternative 4) and southbound from Rock Creek Parkway (2,180 under No Action; 1,150 under Alternative 4). These differences would follow from the greater use drivers would make of the Potomac Freeway under Alternative 4.
- **Ohio Drive and Potomac Freeway** (free-flow conditions instead of LOS F). By grade-separating this intersection, Alternative 4 would replace an intersection projected to operate at LOS F under No Action conditions with a free-flowing intersection. The proposed modification to Ramp RP-5 from the Roosevelt Bridge eastbound would allow a free-flow movement from the ramp to southbound Ohio Drive. As a result, circulation in that part of the study area would be greatly improved, facilitating access to the Kennedy Center from the south.
- **Rock Creek Parkway and Virginia Avenue** (LOS C instead of F). The new ramps providing direct connections to and from Potomac Freeway and Rock Creek Parkway will considerably reduce the volume of vehicles traveling through this intersection, thereby improving operating efficiency. Additionally, the proposed left turn at F Street to access the Kennedy Center garage will further reduce the number of left-turn movements at this intersection, resulting in better operations.

At all other intersections, pre-performance period operations under Alternative 4 would remain at LOS similar to those expected under the No Action Alternative. A partial exception would be the

intersection of 20th Street and Virginia Avenue, which would experience higher traffic volumes due to the elimination of ramp RP-17. However, the LOS at this location would remain within the acceptable range. Taken together, the impact on pre-performance traffic in the study area would be positive. Negative impacts would be minor.

Measures of Effectiveness

Measures of effectiveness (MOE) are explained in Subchapter 3.3.3.3. Table 4.3.12 shows MOE under Alternative 4 during the AM peak period, with corresponding No Action MOE for purposes of comparison. Table 4.3-13 shows the same MOE for the PM peak period, and Table 4.3-14 for the pre-performance period.

Table 4.3-12
Measures of Effectiveness – Alternative 4 (2025) – AM Peak Period

MOE	No Action Alternative	Alternative 4	Measured Improvement¹	Percent Change¹
Total Signal Delay (hr)	713	511	202	28%
Total Travel Time (hr)	1,714	1,513	201	12%
Fuel Consumed (gal)	2,096	1,973	123	6%
Queuing Penalty (veh)	7,714	8,070	-356	-5%
Distance Traveled (mi)	29,505	29,432	73	0%
Stops	67,862	71,961	-4,099	-6%
1: A positive measure indicates an improvement; a negative measure indicates a deterioration.				

As can be seen in Table 4.3-12, AM peak MOE under Alternative 4 would be better than MOE under the No Action Alternative on three measures – 28 percent less time would be spent by drivers in waiting for signals to change; travel time would be reduced by 12 percent; and six percent less fuel would be consumed. On two other measures, the conditions would be slightly worse – a five percent increase in queuing and a six percent increase in the number of stops. There would be no noticeable difference in distance traveled. Overall, these results indicate that during the AM peak, the study area transportation system under Alternative 4 would be slightly more efficient than it would be under the No Action Alternative.

Table 4.3-13 shows that, with the exception of a 15 percent improvement in total signal delay, the differences in MOE between the No Action Alternative and Alternative 4 are minor, ranging from a five percent advantage for Alternative 4 to a one percent advantage for the No Action Alternative. Overall, then, under Alternative 4 in the PM peak period, the study area transportation network would work at least as efficiently as and probably slightly better than under No Action conditions.

Table 4.3-13
Measures of Effectiveness – Alternative 4 (2025) – PM Peak Period

MOE	No Action Alternative	Alternative 4	Measured Improvement ¹	Percent Change ¹
Total Signal Delay (hr)	392	332	60	15%
Total Travel Time (hr)	1,237	1,177	60	5%
Fuel Consumed (gal)	1,589	1,534	55	3%
Queuing Penalty (veh)	7,041	7,096	-55	-1%
Distance Traveled (mi)	25,339	25,355	-16	0%
Stops	46,757	44,777	1,980	4%
1: A positive measure indicates an improvement; a negative measure indicates a deterioration.				

Table 4.3-14
Measures of Effectiveness – Alternative 4 (2025) – Pre-performance Period

MOE	No Action Alternative	Alternative 4	Measured Improvement ¹	Percent Change ¹
Total Signal Delay (hr)	3,938	269	3,669	93%
Total Travel Time (hr)	4,687	1,162	3,525	75%
Fuel Consumed (gal)	4,643	1,546	3,097	67%
Queuing Penalty (veh)	8,820	6,306	2,514	29%
Distance Traveled (mi)	26,128	25,843	285	1%
Stops	101,243	49,290	51,953	51%
1: A positive measure indicates an improvement; a negative measure indicates a deterioration.				

Table 4.3-14 shows that pre-performance MOE under Alternative 4 would be substantially better than under the No Action Alternative. Total signal delay time would be reduced by 93 percent; total travel time by 75 percent, fuel consumption by 67 percent, the number of stops by 51 percent, and queuing by 29 percent. For only one measure – distance traveled – would the difference be minor, at one percent better than under No Action conditions. Thus, the efficiency of the study area transportation network under Alternative 4 would be considerably improved relative to No Action conditions.

Accidents/Safety

The impacts of Alternative 4 on safety would be positive. Two primary locations were identified as safety concerns for both pedestrians and vehicles: 1) the intersection of the Potomac Freeway and Ohio Drive and 2) the intersection of Virginia Avenue and Rock Creek Parkway (see Subchapter 3.3.3.5). The improvements proposed under Alternative 4 would mitigate these concerns at both locations for pedestrians and vehicles.

The proposed grade separation at the intersection of Potomac Freeway and Ohio Drive would

eliminate conflicting vehicle-turning movements, thus improving the safety of the intersection. Pedestrians would be provided with exclusive grade-separated crossings for the Potomac Freeway/Ohio Drive intersection and Ramp RP-5, eliminating crossing conflicts and enhancing safety.

The new connections between the Potomac Freeway and the Rock Creek Parkway in the North Sector would reduce traffic volumes at the intersection of Virginia Avenue and Rock Creek Parkway, thus improving safety. Improvement of pedestrian crossings (discussed in Subchapter 4.3.1.3) would enhance pedestrian safety at this intersection.

4.3.3.3 Alternative 4V

Major Approach Routes to the Kennedy Center

Under Alternative 4V, as under Alternative 4, existing major access routes to the Kennedy Center would be maintained and improved. A new major access route would be created from the east, via E Street and the proposed plaza. Impacts on vehicular access routes to the Kennedy Center would be substantial and positive.

Theodore Roosevelt Bridge

Under Alternative 4V, the Theodore Roosevelt Bridge would remain a major access route to the Kennedy Center via Rock Creek Parkway. The proposed improvements in the South Sector would have a substantial positive impact on this route. The realignment of the Potomac Freeway/Ohio Drive intersection and addition of a signalized intersection, along with the reconstruction of Ramp RP-5 (ramp numbers are shown in Appendix A, Figure 3.3-2) would eliminate the queues that presently form on Ramp RP-5 during the pre-performance period as a result of the unsafe stop-controlled intersection at the bottom of the ramp at Ohio Drive. Traffic from RP-5 bound for the Kennedy Center via Rock Creek Parkway would be provided with a dedicated lane to travel northbound on Ohio Drive. Additionally, ramp traffic bound for the Center would no longer be blocked by vehicles queued at the stop sign waiting for gaps in traffic along Ohio Drive and would be free-flowing at all times. As a result, the few patrons currently reaching the Center from Roosevelt Bridge via the Potomac Freeway and 27th Street would likely use Ohio Drive and the parkway instead.

Rock Creek Parkway

Under Alternative 4V, the Rock Creek Parkway southbound would continue to be a major access route to the Kennedy Center. Patrons could continue to reach the Center from the north by turning from the parkway onto Virginia Avenue. From Virginia Avenue, drivers could then reach the Center via either New Hampshire Avenue or extended 25th Street and the new plaza. The proposed improvements to the connection between the parkway, Virginia Avenue, 27th Street, and the Potomac Freeway would have a positive effect on this route because it would improve traffic flow from the parkway onto Virginia Avenue.

Additionally, the existing signalized intersection at F Street and a proposed new signalized intersection at the south garage entrance would provide left-turn phases to allow access from

southbound Rock Creek Parkway to the Kennedy Center garages.

South of the Kennedy Center, northbound Rock Creek Parkway would continue to be a major access route for patrons from Virginia and from Independence Avenue. Access via this route would be substantially improved by the proposed modifications to the Potomac Freeway/Ohio Drive intersection.

New Hampshire Avenue

Under Alternative 4V, New Hampshire Avenue would continue to serve as a major approach route from the north and northeast. From Juarez Circle, patrons could approach the Kennedy Center by either staying on the avenue to F Street or by turning onto 25th Street to the new plaza.

Virginia Avenue

As indicated above, under Alternative 4V, Virginia Avenue west of Juarez Circle would continue to serve patrons reaching the Kennedy Center via Rock Creek Parkway. East of Juarez Circle, Virginia Avenue would likely be replaced as an approach route from the east by the new, decked E Street.

Ohio Drive

Under Alternative 4V, Ohio Drive would continue to provide access to the Kennedy Center from Independence Avenue and beyond via Rock Creek Parkway. Access via this route would be improved by the proposed modifications to the Potomac Freeway/Ohio Drive intersection. As a result, the few patrons currently reaching the Center from Ohio Drive via the Potomac Freeway and 27th Street would likely stay on Ohio Drive to the Rock Creek Parkway.

27th Street

Under Alternative 4V, 27th Street would continue to be used by patrons approaching the Kennedy Center from K Street/Whitehurst Freeway. From 27th Street, patrons would continue onto Virginia Avenue to the Center, as they currently do. The proposed improvements to the intersection of 27th Street, Virginia Avenue, and Rock Creek Parkway would have a positive impact on this route, as Potomac Freeway traffic destined for northbound Rock Creek Parkway would instead use the new ramp northbound, avoiding 27th Street entirely. Also, the proposed improvements in the South Sector may cause some patrons using 27th Street from northbound Potomac Freeway to stop doing so, as the approach via Ohio Drive and the Rock Creek Parkway would become more attractive, as indicated above.

E Street

Under Alternative 4V, E Street would be decked and would provide at-grade access to the Kennedy Center via the proposed plaza. This access route currently is not available, and its creation would represent a major positive impact on access to the Center. The new route would likely mostly serve patrons approaching the Center from the east and downtown Washington, as well as those approaching it from Lincoln circle via 23rd Street. Now, this traffic uses Virginia Avenue to reach the Center. The new access route would result in less traffic on the avenue and around Juarez Circle.

Major Highways and Streets

Alternative 4V would result in substantial changes to several roads and streets within the study area. The impacts of these changes would be positive, as they would improve the efficiency of the road network and result in easier and generally faster travel to and from the Kennedy Center as well as through the study area.

Theodore Roosevelt Bridge and Ramps

No changes to the main span of the Theodore Roosevelt Bridge are proposed under Alternative 4V. Some of the ramps linking the bridge to the District's road network would be affected. No movements would be eliminated. Ramp RP-6 (ramp numbers are shown in Appendix A, Figure 3.3-2), connecting the bridge inbound to the E Street Expressway eastbound and the Potomac Freeway northbound (via ramp RP-12) would be rebuilt to connect to the lowered freeway under the proposed deck. Ramp RP-13 (southbound Potomac Freeway to eastbound E Street Expressway) would be eliminated, resulting in a major improvement to traffic along Ramp RP-6 (inbound Roosevelt Bridge to eastbound E Street Expressway). Currently, the three eastbound E Street Expressway travel lanes are fed by one lane each from ramps RP-6, RP-8 and RP-13. Ramp RP-6 consists of two travel lanes that must merge into one lane before joining the expressway. Eliminating ramp RP-13 would make it possible to allow both lanes of RP-6 to continue onto the E Street Expressway, eliminating the need to merge.

Ramp RP-5, connecting the inbound bridge to southbound Potomac Freeway and Ohio Drive, would be rebuilt as part of the proposed improvements to the intersection of the freeway with Ohio Drive. The buttonhook linking the ramp to the northbound parkway and the Kennedy Center would be moved a short distance to the west of its current location. A dedicated lane would be built, allowing traffic to enter the parkway without having to merge. This would put an end to the queuing now frequently observed on that ramp, often extending back onto the bridge. Thus, the impacts of the proposed changes on the bridge and associated ramps would be positive.

Potomac Freeway

Alternative 4V would result in substantial physical changes to the Potomac Freeway throughout the study area. These changes would have the positive result of making this underutilized facility more attractive to commuters presently using the Rock Creek Parkway to reach Independence Avenue or the Roosevelt Bridge. Impacts on the freeway would therefore be positive.

In the North Sector, the system of ramps that currently ends the Potomac Freeway and connects it to nearby roads would be altered in the following manner (see Appendix A, Figure 4.3-5, Alternative 4V - Rock Creek Parkway & Virginia Avenue Intersection):

- Ramp RP-20, which presently carries two northbound freeway lanes to an intersection with 27th Street, would be realigned slightly to the south and would be reconstructed as a bridge section to pass over the new ramp from Rock Creek Parkway to southbound Potomac Freeway, as described below. Additionally, a new ramp would be built branching off Ramp RP-20 and connecting it with northbound Rock Creek Parkway, where a signalized intersection would control traffic movements. The new ramp would

carry two lanes of northbound traffic. Its primary purpose would be to provide a direct connection between the northbound Potomac Freeway and northbound Rock Creek Parkway and reduce the traffic flowing through the congested intersection of Rock Creek Parkway and Virginia Avenue, thus improving access for patrons of the Kennedy Center.

- A new connection would be built between the Rock Creek Parkway and the southbound Potomac Freeway adjacent to the new ramp described above. As this ramp passes below K Street, it would continue on a downward grade to pass under the slightly re-aligned RP-20 ramp. The new connection would be two lanes traveling southeast towards southbound Potomac Freeway. The creation of this new connection between the Rock Creek Parkway and the Potomac Freeway southbound would make possible the removal of the existing access ramp from 27th Street on I Street to the southbound freeway, which is now used by drivers who need to go from the southbound parkway to the southbound freeway. This would reduce the number of vehicles flowing through the congested intersection of Rock Creek Parkway and Virginia Avenue.

North of K Street, both new ramps would merge into a four-lane-wide, separated facility running along the alignment of existing Ramp RP-24 between Whitehurst Freeway/K Street and Rock Creek Parkway. Ramp RP-24 would be eliminated, as would existing Ramp RP-25 connecting northbound Rock Creek Parkway to westbound Whitehurst Freeway/K Street. Movement between Rock Creek Parkway and Whitehurst Freeway/K Street would be via 27th Street.

As a result of these improvements, the Potomac Freeway is expected to become much more attractive to commuters, leading to less commuter traffic on the Rock Creek Parkway south of Virginia Avenue.

In the Center Sector, to accommodate the proposed deck east of the Kennedy Center, the Potomac Freeway would be lowered by up to 20 feet over approximately 2,000 feet between Juarez Circle and the Roosevelt Bridge interchange. About 700 feet of the freeway would be under the proposed deck. Additionally, Ramp RP-13, which currently links the southbound freeway to eastbound E Street Expressway, would be eliminated. This movement would not be replaced, but impacts on the system's connectivity would be minor, as only 2,300 vehicles a day have been found to use the ramp. Ramp RP-10, which connects the freeway to the Roosevelt Bridge, would be reconstructed to accommodate the deck, as would Ramp RP-8, which connects the northbound freeway to the E Street Expressway eastbound. An exit ramp from the proposed parking garage under the deck would connect to the reconstructed ramp, providing direct access to the bridge westbound.

In the South Sector, after emerging from under the deck, the Potomac Freeway would be realigned (see Appendix A, Figure 4.3-6, Alternative 4V - Potomac Freeway & Ohio Drive Intersection) and its intersection with Ohio Drive modified to make it an at-grade, signalized intersection. For reasons of safety and geometry, the existing U-turn linking the southbound and northbound lanes of the freeway would be eliminated. Safer and more prudent means of accessing E Street and the Roosevelt Bridge would be available.

Following these improvements, the Potomac Freeway is expected to become much more attractive to commuters, resulting in less commuter traffic on the Rock Creek Parkway south of Virginia Avenue.

E Street Expressway

Alternative 4V would result in substantial physical changes to the E Street Expressway. The impacts of these changes on traffic and system connectivity would range from negligible to positive.

The E Street Expressway would be entirely decked over between Virginia Avenue and the proposed plaza east of the Kennedy Center. To accommodate the deck, several ramps associated with the expressway would have to be rebuilt or removed. Ramp RP-11, which connects the expressway to the Roosevelt Bridge westbound, would be reconstructed and the access it currently provides to the southbound Potomac Freeway via Ramp RP-9 would be eliminated. This movement would not be replaced, but the impacts of its removal on the system's connectivity would be negligible, as only 65 vehicles a day have been found to use ramp RP-9.

The access ramp leading from westbound E Street Expressway to northbound Potomac Freeway (Ramp RP-14) would be realigned to accommodate the deck and the lowering of the freeway. The buttonhook allowing access to E Street from the ramp linking the eastbound expressway to Virginia Avenue along the northern side of the State Department (Ramp RP-17) would be eliminated, but the ramp and the access it provides from the expressway eastbound to Virginia Avenue would be maintained.

E Street

E Street west of Virginia Avenue is now a one-way side street that terminates in a ramp to the northbound Potomac Freeway (Ramp RP-15). Under Alternative 4V, this section of E Street would be recreated as a surface street on the deck over the E Street Expressway. The new surface E Street would have sidewalks on each side and two lanes of traffic in each direction, separated by a cascading fountain that would grow wider as it approaches the proposed plaza. On the plaza, the E Street lanes would form a circle, with a connection with 25th Street at its northwest quadrant. The new E Street would connect the new plaza and the Kennedy Center to the downtown street grid.

As part of the reconstruction of E Street, Ramp RP-15 would be eliminated and access to the Potomac Freeway would be from the E Street Expressway only. The impacts on traffic and connectivity from eliminating this movement would be minor, as only 465 vehicles a day have been found to use ramp RP-15; these vehicles would have to use the expressway to access the Potomac Freeway. Overall, then, the impacts of the proposed changes on E Street would be overwhelmingly positive.

20th Street

Under Alternative 4V, there would be no changes to 20th Street.

Rock Creek Parkway

Under Alternative 4V, physical changes to the Rock Creek Parkway would only occur in the North Sector of the study area. The current intersection between the northbound lanes of the parkway and Ramp RP-24 from Whitehurst Freeway/K Street would be upgraded and widened to accommodate the two new ramps to and from the Potomac Freeway. This new signalized intersection would

occupy roughly the same space now occupied by the junction with the parkway of ramps RP-24, which would be eliminated, as described under *Potomac Freeway*.

The new connections between Rock Creek Parkway and Potomac Freeway in the north, and between the Potomac Freeway and Ohio Drive in the south, are expected to make the freeway a more attractive option for commuters. As a result, the parkway between the new connections described above and the connection with Ohio drive at the Belvedere would be expected to experience less-heavy traffic volumes. The impacts of the proposed changes on the parkway would be positive because they would improve its connections with the surrounding road network, and, south of Virginia Avenue, return the parkway to traffic volumes more in keeping with its parkway status. Shifting much of the heavy northbound parkway traffic to the Potomac Freeway would allow for the creation of a new signalized left-turn movement from southbound Rock Creek Parkway into the Kennedy Center south garage entrance. The signalized intersection at Rock Creek Parkway and F Street would also provide a left-turn movement.

Ohio Drive

Alternative 4V would realign Ohio Drive between the ramp linking it to Lincoln Circle and the Rock Creek Parkway, as shown in Appendix A, Figure 4.3-6. The purpose of the realignment would be to create a new, improved signalized intersection between Ohio Drive and the Potomac Freeway. In conjunction with the reconstruction of Ramp RP-5 from the Roosevelt Bridge, this change would solve the functional and safety problems that characterize this intersection presently. The impacts of the proposed changes on Ohio Drive would therefore be positive.

Virginia Avenue

Under Alternative 4V, the intersection of Virginia Avenue with E Street would be rebuilt to accommodate the new E Street. There would be no other physical change to Virginia Avenue. Near the Rock Creek Parkway, Virginia Avenue would benefit from the improvement proposed for the intersection with 27th Street, the parkway, and the Potomac Freeway. Overall, impacts on Virginia Avenue would be negligible or positive.

New Hampshire Avenue

There would be no changes to New Hampshire Avenue under Alternative 4V.

Constitution Avenue

There would be no changes to Constitution Avenue under Alternative 4V.

27th Street

Under Alternative 4V, intersections between 27th Street and the ramps connecting it to the Potomac Freeway would be reconstructed. The purpose and principal impact of these changes would be to improve the connection between 27th Street, the Rock Creek Parkway, the Potomac Freeway, and Virginia Avenue, as described below. As part of the proposed changes, the entire length of 27th Street between K Street and Virginia Avenue would be rebuilt. Sidewalks would be provided.

Additionally, access from Virginia Avenue to K Street/Whitehurst Freeway via northbound 27th Street would be provided, improving this movement by making it more direct.

Rock Creek Parkway/Virginia Avenue/I Street/27th Street Intersection

Changes proposed for the North Sector of the study area under Alternative 4V have as their main purpose improving this intersection. In addition to the changes described under *Potomac Freeway* and *Rock Creek Parkway*, Alternative 4V would affect the intersection by eliminating the existing access from 27th Street to the southbound Potomac Freeway via I Street/Ramp RP-18. I Street would become a dead-end street serving the three houses standing at its northeastern corner with 27th Street.

25th Street

Under Alternative 4V, 25th Street would be maintained on or near its existing alignment. It would connect to the circle on the plaza, connecting it to the street grid the on the north. Impacts on 25th Street and the road network would be positive, as the proposed change would recreate links with the rest of the downtown street grid.

F Street

A left-turn movement from southbound Rock Creek Parkway to northbound F Street would be created to allow access to the Kennedy Center garage entrance. This left-turn movement would be made possible by shifting much of the heavy northbound Rock Creek Parkway traffic to the Potomac Freeway, thus minimizing opposing traffic volumes for left-turning vehicles.

Traffic Analysis

Levels of Service (LOS)

The same methodology was used to assess the impact of Alternative 4V on LOS as was used to assess the impacts of Alternative 4. The number of generated trips would be the same as under Alternative 4.

Alternative 4V Year 2025 AM and PM Peak Period LOS

Predicted AM and PM peak-period traffic volumes under Alternative 4V are shown in Figures F-15 (Year 2025 AM Peak Hour Traffic Volumes Alternative 4V) and F-16 (Year 2025 PM Peak Hour Traffic Volumes Alternative 4V) in Appendix F, along with the LOS calculated on the basis of these volumes for AM and PM peak periods. Table F-5 in Appendix F presents the results in summary form.

Under Alternative 4V, two of the 20 study intersections would be eliminated, one would be considerably modified, and two new intersections would be created. LOS for 16 of the 18 existing intersections that would be maintained would be better or similar to No Action LOS, while LOS at one intersection would deteriorate.

The intersection of **27th Street and I Street** is one of the two intersections that would be eliminated, as the proposed new connections between the Potomac Freeway and Rock Creek Parkway would eliminate the need for it. Under No Action conditions, this intersection was projected to operate at LOS F in the AM peak. Elimination of this congested intersection would have a positive impact on the transportation network in the study area.

The second intersection that would be eliminated under Alternative 4V is that of **Ramp 24 (from K Street/Whitehurst Freeway) and Rock Creek Parkway (northbound)**. Under the No Action Alternative, this intersection would operate at an acceptable LOS C in the PM Peak (it would be closed in the AM peak, when all parkway lanes are southbound), but it would remain underutilized and unsafe, as it is today, due to the lack of an acceleration lane and poor sight distance. Elimination of this intersection, and its replacement with a new intersection with ramps to and from the Potomac Freeway, would contribute to improving operations within the study area, as described below.

Under Alternative 4V, the existing at-grade, stop-controlled intersection between the **Potomac Freeway southbound and Ohio Drive** would be considerably modified, as it would be replaced by a signalized intersection. The proposed signal would not operate during the PM peak period, as all conflicting movements during these time periods would be prohibited, as is the case under existing conditions. The proposed signal may operate during the AM peak period at an acceptable LOS, or depending on demand, left turns from Ohio Drive to northbound Rock Creek Parkway may have to be prohibited to eliminate conflicting movements. Therefore, the change would have no impacts on peak-period LOS, and operations as the existing intersection would continue to operate in free-flow conditions during both the AM and PM peak periods.

Two new intersections would be created under Alternative 4V:

- **New ramps to and from Potomac Freeway and Rock Creek Parkway.** This intersection would replace that of Ramp RP-24 with the parkway and would be signalized. In the AM peak, when all parkway lanes are southbound, the signal would be turned off, and the new ramp's northbound lanes would be closed. Vehicles traveling southbound in the easternmost lane of the parkway would use the new ramp's southbound lanes to access southbound Potomac Freeway directly. In the PM peak, when all parkway lanes are northbound, the intersection would operate to control vehicles traveling northbound in the easternmost lanes of the parkway and those traveling in the new ramp's northbound lanes from Potomac Freeway. The new ramp's southbound lanes would be closed during the PM peak. The creation of this new connection and intersection would contribute to diverting a large amount of traffic from the Virginia Avenue/Rock Creek Parkway intersection and the Virginia Avenue/27th Street intersection, thereby improving operations at both. During non-peak periods, traffic to and from Potomac Freeway would be signal-controlled, with the right lane of southbound Rock Creek Parkway essentially operating in a free-flow mode. The intersection would operate at an acceptable LOS at all times.
- **New ramps to and from Potomac Freeway and 27th Street:** This new intersection would control movements to and from 27th Street and the Potomac Freeway. The new ramps would divert a large amount of traffic from the Virginia Avenue/Rock Creek Parkway intersection, thereby improving operating conditions at this currently-congested

intersection and improving access to the Kennedy Center. This new intersection is projected to operate at acceptable LOS in both the AM and PM peak periods.

The only existing intersection that would be negatively affected under Alternative 4V is that of **Ramp RP-17 off the E Street Expressway (eastbound) and Virginia Avenue**. The existing buttonhook allowing access to westbound E Street from the ramp would be eliminated, but the ramp itself and the access it provides from the expressway eastbound to Virginia Avenue would be maintained. In order to access 23rd Street, traffic that currently uses the buttonhook ramp would need to make a left turn onto Virginia Avenue and then another left onto eastbound E Street. In addition, the removal of the ramp from southbound Potomac Freeway to eastbound E Street Expressway would result in additional southeast-bound through traffic on Virginia Avenue, further contributing to the degradation of this intersection. As a result, the intersection, which is projected to operate at LOS E in the AM peak and D in the PM peak under No Action conditions, would operate at LOS F in the AM peak and LOS E in the PM peak under Alternative 4V.

This adverse impact would be mitigated by making this currently stop-controlled intersection a signalized intersection to accommodate the additional left-turn movements. Installation of a signal would bring the intersection to LOS A during both peak periods.

Generally, the impacts of Alternative 4V on rush-hour traffic through the study area would be positive. Assuming the impact on the intersection of ramp RP-17 off the E Street Expressway and 27th Street is mitigated by signalizing the intersection, negative impacts would be minor.

Alternative 4V Year 2025 Pre-Performance Period LOS

LOS analysis was also performed for the pre-performance period (6:30 PM to 7:30 PM). Results are shown in Figure F-17 (Year 2025 Pre-performance Peak Hour Traffic Volumes Alternative 4V) and in Table F-6 of Appendix F.

Under Alternative 4V, during the pre-performance peak, operations would be considerably better than under No Action conditions at two intersections:

- **Ohio Drive and Potomac Freeway** (LOS A instead of LOS F). By signalizing this intersection and providing better access to Rock Creek Parkway via the Potomac Freeway, Alternative 4V would replace an intersection projected to operate at LOS F under No Action conditions with a signalized intersection projected to operate at LOS A. As a result, circulation in this part of the study area would be greatly improved, facilitating access to the Kennedy Center from the South Sector.
- **Rock Creek Parkway and Virginia Avenue** (LOS D instead of F). The new ramps providing direct connections to and from Potomac Freeway and Rock Creek Parkway would considerably reduce the number of vehicles traveling through this intersection, thus improving operating efficiency. Additionally, the proposed left turn at F Street to access the Kennedy Center garage would further reduce the number of left-turn movements at this intersection, resulting in better operations.

At all other intersections, pre-performance period operations under Alternative 4V would remain at LOS similar to those expected under the No Action Alternative. Taken together, the impact on pre-

performance traffic in the study area would be positive. Negative impacts would be minor.

Measures of Effectiveness

Measures of effectiveness (MOE) are explained in Subchapter 3.3.3.3. Table 4.3-15 shows MOE under Alternative 4V during the AM peak period, with corresponding No Action MOE for purpose of comparison. Table 4.3-16 shows the same MOE for the PM peak period, and Table 4.3-17 for the pre-performance peak period.

Table 4.3-15
Measures of Effectiveness – Alternative 4V (2025) – AM Peak Period

MOE	No Action Alternative	Alternative 4V	Measured Improvement ¹	Percent Change ¹
Total Signal Delay (hr)	713	485	228	32%
Total Travel Time (hr)	1,714	1,497	217	13%
Fuel Consumed (gal)	2,096	1,958	138	7%
Queuing Penalty (veh)	7,714	7,581	133	2%
Distance Traveled (mi)	29,505	29,701	-196	-1%
Stops	67,862	71,138	-3,276	-5%
1: A positive measure indicates an improvement; a negative measure indicates a deterioration.				

As can be seen in Table 4.3-15, AM peak MOE under Alternative 4V would be better than under the No Action Alternative on four of the six measures and slightly worse on the remaining two. Total time spent by drivers waiting for signals would decrease by 32 percent, total travel time by 13 percent, fuel consumption by seven percent, and queuing penalty by two percent, but distance traveled would increase by one percent and the number of stops by five percent. In general, during the AM peak, the study area transportation system under Alternative 4V would be at least as efficient as, and probably slightly more so than, it would be under the No Action Alternative.

Table 4.3-16
Measures of Effectiveness – Alternative 4V (2025) – PM Peak Period

MOE	No Action Alternative	Alternative 4V	Measured Improvement ¹	Percent Change ¹
Total Signal Delay (hr)	392	287	105	27%
Total Travel Time (hr)	1,237	1,127	110	9%
Fuel Consumed (gal)	1,589	1,487	102	6%
Queuing Penalty (veh)	7,041	6,060	981	14%
Distance Traveled (mi)	25,339	25,182	157	1%
Stops	46,757	43,457	3,300	7%
1: A positive measure indicates an improvement; a negative measure indicates a deterioration.				

Table 4.3-16 shows that PM peak MOE under Alternative 4V would be better than MOE under the No Action Alternative on all six measures. Total time spent by drivers waiting for signals would decrease by 27 percent, total travel time by nine percent, fuel consumption by six percent, queuing penalty by 14 percent, distance traveled by one percent, and stops by seven percent. During the PM peak, therefore, the study area transportation system under Alternative 4V would be slightly to moderately more efficient than it would be under the No Action Alternative.

As was true in the case of Alternative 4, the most substantial and pronounced improvements in MOE under Alternative 4V would be realized in the pre-performance peak period, as Table 4.3-17 makes clear. Total signal delay time would be reduced by 91 percent; total travel time by 74 percent, fuel consumption by 65 percent, the number of stops by 48 percent, queuing by 12 percent, and distance traveled by one percent. Thus, the efficiency of the study area transportation network under Alternative 4 would be considerably improved relative to No Action conditions.

Table 4.3-17
Measures of Effectiveness – Alternative 4V (2025) – Pre-performance Period

MOE	No Action Alternative	Alternative 4V	Measured Improvement ¹	Percent Change ¹
Total Signal Delay (hr)	3,938	345	3,593	91%
Total Travel Time (hr)	4,687	1,226	3,461	74%
Fuel Consumed (gal)	4,643	1,611	3,032	65%
Queuing Penalty (veh)	8,820	7,754	1,066	12%
Distance Traveled (mi)	26,128	25,789	339	1%
Stops	101,243	52,729	48,514	48%
1: A positive measure indicates an improvement; a negative measure indicates a deterioration.				

Summary and Comparison of Measures of Effectiveness

A summary of MOE projections under Alternatives 4 and 4V for Year 2025 AM, PM, and Pre-Performance Peak Periods is tabulated in Table 4.3-18 for comparison purposes. MOE projections for Alternatives 4 and 4V are mostly similar for all six measures in each peak period.

As Table 4.3-18 indicates, substantial differences in effectiveness between the two action alternatives are very few: in the PM peak, total signal delay and queuing penalty are relatively more markedly improved over No Action conditions under Alternative 4V, whereas in the pre-performance peak, queuing penalty is relatively better under Alternative 4. What Table 4.3-18 shows most clearly, however, is that, compared to No Action conditions, implementation of either Alternative 4 or Alternative 4V would increase the overall efficiency of the road network in both the AM and PM peaks, and increase it dramatically in the pre-performance peak.

Table 4.3-18
Measures of Effectiveness – Alternatives 4 and 4V Compared
AM, PM and Pre-Performance Peak Periods (2025)

MOE	Percent Change in Effectiveness Relative to No Action Alternative ¹					
	AM Peak		PM Peak		Pre-Performance Peak	
	Alternative 4	Alternative 4V	Alternative 4	Alternative 4V	Alternative 4	Alternative 4V
Total Signal Delay (hr)	28%	32%	15%	27%	93%	91%
Total Travel Time (hr)	12%	13%	5%	9%	75%	74%
Fuel Consumed (gal)	6%	7%	3%	6%	67%	65%
Queuing Penalty (veh)	-5%	2%	-1%	14%	29%	12%
Distance Traveled (mi)	0%	-1%	0%	1%	1%	1%
Stops	-6%	-5%	4%	7%	51%	48%
1: A positive measure indicates an improvement; a negative measure indicates a deterioration.						

Accidents/Safety

Impacts on safety under Alternative 4V would be similar to those under Alternative 4, with one exception: a signalized intersection at Potomac Freeway and Ohio Drive would replace the existing stop-controlled intersection, which would make the intersection safer for motorists.

4.3.4 Transit Access

4.3.4.1 No Action Alternative

Under the No Action Alternative, there would be no transit improvements. No known transit project depends on the proposed action for its completion. Therefore, the No Action Alternative would not have any impacts on transit service in the area.

Metrorail

Access to the Kennedy Center from the Foggy Bottom Metrorail Station would continue to be by walking and the Kennedy Center Show Shuttle. No changes to the shuttle service are anticipated.

Metrobus

Metrobus Route 80 – the North Capital Street Line – serves the Kennedy Center directly. No changes to this service are anticipated.

Kennedy Center Show Shuttle Bus

The Kennedy Center's fleet of eight shuttle buses would operate as they do now.

Tourmobiles

The National Park Service tourist transit operation to major tourist attractions on or near the Washington Mall would be reinstituted to the Kennedy Center upon completion of the Garage Expansion and Site Improvement program.

Tour Buses

Charter buses to the Kennedy Center would benefit from the provision of surface parking south of the Center as part of the Garage Expansion and Site Improvement project.

School Buses

School buses would benefit from the provision of surface parking south of the Kennedy Center as part of the Garage Expansion and Site Improvement project.

4.3.4.2 Alternative 4

The impacts on Alternative 4 on transit would be positive or negligible. No negative impacts are expected.

Metrorail

Under Alternative 4, access to the Kennedy Center from the Foggy Bottom Metrorail Station would continue to be by walking and the Kennedy Center Show Shuttle. Impacts of Alternative 4 on walking times from the Foggy Bottom station are discussed in Subchapter 4.3.1.3. Impacts on the Show Shuttle are discussed below.

Metrobus

Metrobus Route 80 – the North Capital Street Line – serves the Kennedy Center directly. No changes to this service would result from implementing Alternative 4, although proposed roadway improvements may be expected to reduce travel times.

Kennedy Center Show Shuttle Bus

The Kennedy Center's fleet of eight shuttle buses would continue to operate as it does now. The reconstruction of E Street as a surface street with direct access to the Kennedy Center via the proposed plaza would provide the shuttle with a new route (via 23rd Street) that would be more direct than the existing one and avoid local residential streets. Run times are expected to decrease, and reliability is expected to increase. Reduced run times could either result in more frequent service or in a reduction in the number of buses needed to maintain the present service.

Tourmobiles

Tourmobiles would benefit from the proposed action because the reconstruction of E Street as a surface street providing access to the Kennedy Center from the east would offer a new approach

route more in keeping with the status of the Center as a presidential memorial and major tourist destination. Access via the plaza at 23rd Street would reduce travel times and improve service by eliminating the circuitous Virginia Avenue routing.

Tour Buses

Charter buses to the Kennedy Center would benefit from improved access from 23rd Street via E Street and the proposed plaza and from the general reduction in congestion through the study area.

School Buses

School buses accessing the Kennedy Center would benefit from improved access from 23rd Street via E Street and the proposed plaza, and the general reduction in congestion through the study area.

4.3.4.3 Alternative 4V

The impacts of Alternative 4V on transit access would be similar to those of Alternative 4 and would be positive.

4.3.5 Parking

4.3.5.1 No Action Alternative

The No Action Alternative would not affect parking at the Kennedy Center or in the study area. Once the parking improvements at the Kennedy Center presently being made under the Garage Expansion and Site Improvement project are completed, parking supply at the Center will be increased by approximately 525 spaces. This is expected to eliminate most or all of the impacts on the neighborhood from patrons presently unable to park at the site during performances and who consequently park at nearby parking areas and on Foggy Bottom streets. The Garage Expansion and Site Improvement project also includes provision of surface parking for school buses and shuttle buses in an open lot to the south of the Kennedy Center. The project is also designed to resolve existing site-access circulation problems for those using the garage.

4.3.5.2 Alternatives 4 and 4V

Under both Alternative 4 and alternative 4V, a single-level parking garage would be built under the proposed plaza, providing approximately 350 new parking spaces. This addition would raise the total number of structured parking spaces at the Kennedy Center to approximately 2,380. To analyze the adequacy of this increase, projected levels of activity at the Center following construction of the plaza and proposed buildings were compared to the proposed additional parking inventory. Depending on cost, a second level may be built to double the additional parking to 700 spaces; the second-level parking spaces have not been included in the calculations.

The maximum number of new spaces needed would be in the AM Peak weekday period, with 122 spaces needed (using the observed vehicle occupancy level of 1.92 for weekdays and 2.3 for weekends). Based on this, the added spaces would be more than sufficient to accommodate the new

demand created by the proposed action. Thus, the proposed action would have no negative impact on parking.

4.3.6 Waterborne Activities

4.3.6.1 No Action Alternative

There would be no changes to waterborne activities under the No Action Alternative.

4.3.6.2 Alternative 4

Alternative 4 would have no direct impact on waterborne activities. However, construction of the proposed dock and pedestrian connection to the Kennedy Center would make possible and encourage access to the Center by water, either via water taxis or touring boats. The provision of a dock would be a step toward implementing NCPC and the Anacostia Waterfront Initiative team's vision of a water-taxi system on the Potomac and Anacostia Rivers. Other nearby users of the river, such as Thompson's Boathouse, would be consulted about any potential effect an increase in waterborne activity might have on their operations, so that impacts on those operations can be minimized. No negative impacts are expected.

4.3.6.3 Alternative 4V

The impacts of Alternative 4V on waterborne activities would be the same as those of Alternative 4.

4.4 Air Quality

The air quality analysis for the No Action Alternative and Alternatives 4 and 4V includes:

- A micro-scale CO analysis of potential impacts from local traffic, using modeling procedures established by the U.S. EPA.
- A CAA Transportation Conformity determination for the proposed action.

Short-term air quality impacts would result from demolition and construction activities associated with Alternatives 4 and 4V. Construction-related impacts on air quality are discussed for each alternative in Subchapter 4.14.

Primary automobile-related or mobile-source air pollutants are CO, NO_x, and VOCs, which are precursor compounds for O₃. Lead emissions from automobiles have declined in recent years through the increased use of unleaded gasoline and are negligible. Potential emissions of particulates and sulfur dioxide from indirect mobile sources, such as automobiles, are negligible compared to emissions from direct non-mobile sources, such as power plants and industrial facilities. The Washington, DC area is classified as being in severe non-attainment for O₃. Therefore, only vehicular CO, NO_x, and VOC emissions are considered in this study.

Air quality impacts from traffic are generally evaluated on two scales:

- Meso-scale: Ozone-precursor compounds NO_x and VOCs are of regional concern due to the DC area's severe non-attainment status for O_3 . Potential emission increases from additional vehicle miles traveled (VMT) or from slower traveling due to traffic delays may affect regional O_3 levels.
- Micro-scale: CO, which is emitted predominantly by motor vehicles, is a site-specific pollutant, with higher concentrations found adjacent to roadways, especially near congested intersections. As a result, it is usually of local concern. CO air quality impacts are evaluated through a micro-scale analysis of traffic-related emission impacts at selected intersections.

Because O_3 is a problem of regional concern and subject to air transport phenomena under different weather conditions, its impact generally is evaluated using regional O_3 airshed models. This type of meso-scale analysis is rarely conducted on a project-by-project basis and will not be necessary for this EA.

The micro-scale analysis of localized existing CO concentrations performed for this EA is based on procedures outlined in these documents:

- *A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections* (U.S. EPA, September 1995).
- *Mobile5b User's Guide* (U.S. EPA, 1997).
- MWCOG-provided Mobile5b input parameters for the District of Columbia (DC) area for summer and winter seasons (Kumar, January 28, 2003).

CO traffic impacts are determined in two steps. First, vehicle-exhaust emission factors are estimated using U.S. EPA's *Mobile5b* emission factor model with DC area-specific input parameters. Second, these emission factors are used with the U.S. EPA CAL3QHC dispersion model to calculate CO concentrations at representative intersections. Total ambient CO concentrations near intersections consist of two components: local-source contributions (i.e., vehicular emissions near intersections) and background contributions from other stationary or natural sources in the project vicinity.

For the purpose of micro-scale analysis, background CO levels in the DC area were obtained from the Virginia Department of Environmental Quality (Ballou, 2000). The background CO levels used are 6.0 ppm for one-hour and 3.0 ppm for eight-hour averages, respectively. A persistence factor of 0.70 was used to convert the one-hour CO concentrations to eight-hour concentrations. The persistence factor represents a combination of both traffic and meteorological conditions.

CO impacts were estimated for receptor locations during weekday AM and PM peak periods and the pre-performance period at the following intersections or intersection clusters:

- **Location 1:** Ohio Drive and Potomac Freeway intersection.
- **Location 2:** Virginia Avenue/Rock Creek Parkway/27th Street/I street intersection cluster.

- **Location 3:** K Street/Whitehurst Freeway/27th Street/Rock Creek Parkway/Potomac Freeway intersection cluster.
- **Location 4:** Intersection of Rock Creek Parkway and proposed new ramps to and from the Potomac Freeway.

These locations are illustrated in Appendix A, Figures 4.4-1 (Modeled Intersections – No Action Alternative), 4.4-2 (Modeled Intersections – Alternative 4), and 4.4-3 (Modeled Intersections – Alternative 4V). These locations were selected for CO modeling based upon their potential for maximum increase in traffic and for maximum traffic congestion with highest traffic volume according to the U.S. EPA’s guidance (September 1995). The configuration of each location varies from alternative to alternative, as shown in the figures. Location 4 would not exist under No Action conditions.

4.4.1 No Action Alternative

Predicted CO concentration levels under the No Action Alternative at the study intersections are shown in Table 4.4-1. The results predicted using the CAL3QHC model show no violations of the one-hour CO standard of 35 ppm or the eight-hour CO standard of 9 ppm for any of the modeled intersections or intersection clusters.

Table 4.4-1
No Action Alternative: Modeled CO Levels¹

Modeled Location	One-Hour Concentration (ppm)	Eight-Hour Concentration (ppm)
Location 1	9.6	5.5
Location 2	11.1	6.6
Location 3	10.4	6.1
Location 4	N/A	N/A
Note: ¹ CO levels include background concentrations of 6.0 ppm (one-hour) and 3.0 ppm (eight-hour). NAAQS CO one-hour standard is 35 ppm; the eight-hour standard is 9 ppm.		

4.4.2 Alternative 4

4.4.2.1 Mobile Sources CO Impact Analysis

As can be seen in Table 4.4-2, micro-scale CO modeling using the approach described above indicates no violations of either the one-hour or the eight-hour CO standard. Consequently, Alternative 4 would have no significant mobile-source localized (micro-scale) air quality impacts.

Table 4.4-2
Alternative 4: Modeled CO Levels¹

Modeled Location	One-Hour Concentration (ppm)	Eight-Hour Concentration (ppm)
Location 1	10.1	5.9
Location 2	8.9	5.0
Location 3	12.0	7.2
Location 4	10.1	5.9
Note: ¹ CO levels include background concentrations of 6.0 ppm (one-hour) and 3.0 ppm (eight-hour). NAAQS CO one-hour standard is 35 ppm; the eight-hour standard is 9 ppm.		

4.4.2.2 Clean Air Act Transportation Conformity Determination

Since the proposed action is a transportation project within a severe non-attainment area for O₃, only the CAA transportation conformity rule applies. The conformity rule requires that the project be part of a conforming TIP for exemption from a meso-scale air quality analysis. The conformity rule also requires that the project not cause or contribute to any new violations of any standards in any area.

With respect to potential meso-scale air quality impacts, the KCAI project is currently not included in the TIP because the project is still in an early planning stage. It is expected, however, that the project will be included in an updated conforming TIP once it is more clearly defined. If Alternative 4 is selected, a regional meso-scale impact analysis would not be required. As discussed in Section 4.4.2.1, no violations of the NAAQS were predicted under Alternative 4 in the micro-scale analysis. Consequently, Alternative 4 is expected to have no significant localized or regional air quality impacts, and would conform to the Clean Air Act transportation conformity rule.

4.4.3 Alternative 4V

4.4.3.1 Mobile Sources CO Impact Analysis

Micro-scale CO levels predicted using the modeling approach described above are shown in Table 4.4-3. They indicate no violations of either the one-hour or the eight-hour CO standard. Consequently, Alternative 4V would have no significant mobile-source localized (micro-scale) air quality impacts.

Table 4.4-3
Alternative 4V: Modeled CO Levels¹

Modeled Location	One-Hour Concentration (ppm)	Eight-Hour Concentration (ppm)
Location 1	10.3	6.0
Location 2	9.6	5.5
Location 3	10.8	6.4
Location 4	11.0	6.5
Note: ¹ CO levels include background concentrations of 6.0 ppm (one-hour) and 3.0 ppm (eight-hour). NAAQS CO one-hour standard is 35 ppm; the eight-hour standard is 9 ppm.		

4.4.3.2 Clean Air Act Transportation Conformity Determination

As with Alternative 4, both micro-scale modeling results and the ultimate inclusion in the future TIP indicate that Alternative 4V would have no significant localized or regional air quality impacts, and would conform with the Clean Air Act transportation conformity rule.

4.5 Noise

This chapter addresses long-term traffic-related noise impacts. Temporary, construction-related noise impacts are addressed in Subchapter 4.14.

Under FHWA noise-analysis procedures, the KCAI project is classified as a Type I noise project for the two action alternatives because it involves: 1) substantial changes – greater than six meters – in the vertical roadway profile of the Potomac Freeway; 2) substantial changes in the horizontal alignment of the traffic lane nearest to a sensitive receptor that would bring the lane half the distance closer to the receptor; and 3) a new route on a new right-of-way. Based on FHWA noise-analysis procedures for Type I highway project, an alternative is considered to create traffic noise impacts if either of the following two conditions occurs:

- **Condition 1.** An increase over existing noise levels reaching at least 6 dBA L_{eq} (1) is predicted to occur. Noise impacts are considered significant if they meet condition 1.
- **Condition 2.** Predicted L_{eq} (1) noise levels under the action alternatives approach or exceed FHWA's Noise Abatement Criteria (NAC). Noise levels are considered to approach the criteria if they fall within 1 dBA of the criteria. For typical noise-sensitive land uses, 67 dBA is the criteria level, so 66 dBA is the applicable threshold. Condition 2 is not in itself a indicator of significance. However, when condition 2 is met, FHWA requires that feasible and reasonable noise-abatement measures be considered to mitigate a noise impact on developed lands.

4.5.1 No Action Alternative

In order to predict noise levels along the project corridor, FHWA's *Traffic Noise Model* (TNM 2.0) (described in Subchapter 3.5) was used to predict noise levels for the year 2025 at the receptor locations modeled for existing conditions. The following conditions were assumed as part of the No Action noise-modeling effort:

- Existing topographic conditions for both main roadways and land uses adjacent to the roadways.
- Year 2025 traffic volumes under No Action Alternative conditions.

The No Action Alternative noise levels are detailed in Appendix G, Table G-2. They do not indicate a significant noise increase (6 dBA or greater) above existing conditions at any receptor locations. Therefore, no significant traffic noise impacts would result from the No Action Alternative (Condition 1).

Under the No Action Alternative, predicted noise levels for 2025 would approach or exceed the 66-dBA NAC level at 17 of the 52 receptor locations for the morning peak period and at 17 of the 52 receptor locations for the evening peak period (Appendix G, Table G-2; exceedances are in boldface. Noise-monitoring and -modeling locations are shown in Appendix A, Figures 3.5-1 and 3.5-2).

4.5.2 Alternative 4

To predict noise conditions under Alternative 4, TNM used 2025 Alternative 4 traffic conditions as well as the proposed roadway improvements. The following major roadway improvements (see Appendix A, Figures 2-9, 2-10, 2-11, and 2-12) were considered in the modeling effort:

- The northern side of the new ramps connecting the Potomac Freeway to Rock Creek Parkway in the North Sector near 27th Street.
- The vertical and horizontal realignment of the Potomac Freeway underneath the plaza in the Center Sector.
- The local roadway interchange on the upper level of the plaza.
- The southern side of the new Potomac Freeway/Rock Creek Parkway/Ohio Drive intersection in the South Sector.

4.5.2.1 Modeling Methodology

TNM is considered an advanced tool to predict highway traffic noise. However, it should be noted that noise reference emissions used in TNM were developed based mainly on unobstructed sound propagation and reflect somewhat different conditions than those applying to noise propagation in some sections of the current project, such as propagation underneath the proposed deck by diffraction from the semi-covered tunnel-like structure. Given such a complex site configuration, this computer program could not be directly used to predict absolute future noise levels. Therefore,

TNM was used to predict future traffic noise degradation, as opposed to absolute future noise levels.

Potential noise impacts from traffic within the tunnel-like structure is a complex problem. The sound can reflect multiple times from the three solid sides of the structure (rooftop, ground, and west wall) and can be diffracted from the open east side to affect those buildings or parks on or near the deck. As indicated above, TNM cannot be used directly to simulate this geometry. However, if the whole modeled section, which includes the tunnel structure and receptors, is rotated 90 degrees so that the opened east side is on top, the modeled section becomes similar to a typical, single parallel-barrier cross-section, for which TNM is capable of performing noise calculations (see Appendix A, Figure 4.5-1, TNM Parallel Barrier Model Illustration). Even though this modeling approach is not perfect, by considering the sound level propagation scheme within a tunnel-like structure it can produce a reasonable approximation.

On this basis, potential noise impacts at nearby receiver locations were simulated through the following steps:

- Modeling contributions from all traffic (except traffic underneath the plaza) by considering parameters such as speed, volume, Potomac Freeway alignment, elevation, etc.
- Redirecting contributions from traffic underneath the plaza by rotating the modeled cross-section 90 degrees and then:
 - Using the TNM normal mode first, which does not deal with multiple-barrier reflection, for the Alternative 4 traffic conditions.
 - Using the TNM parallel-barrier analysis mode to determine the noise degradation level resulting from parallel-barrier multi-reflection.
 - Justifying the results from the TNM normal mode by adding a degradation increment.
- Adding the two modeled noise contributions logarithmically to determine the total traffic noise impact at each receiver location.

4.5.2.2 Modeling Results

Alternative 4 noise levels predicted by the model are shown in Appendix G, Table G-3. They indicate that:

- Potential increases in noise levels above the existing conditions would not be substantial (i.e., 6 dBA or greater) at any receptor locations, and therefore, by Condition 1, ***no significant traffic noise impacts would result from Alternative 4.***
- However, ***impacts would result under Alternative 4*** by Condition 2, since the noise level predictions exceed NAC levels at 18 receptor locations for the morning peak period and 20 receptor locations for the evening peak period (locations are shown in Appendix A, Figures 3.5-1 and 3.5-2).

At those locations where predicted noise levels would meet or exceed the 66 dBA threshold, this exceedance would also occur under No Action conditions, with one exception in the morning peak—Location 2-9 – and three exceptions in the evening peak – Locations 2-10, 5-2, and 5-6 (see

locations in Appendix A, Figure 3.5-2). Under existing conditions, 14 of the 18 locations that would exceed the 66-dBA NAC level in the morning peak already experience noise levels at or above this threshold. In the evening peak, 12 of the 20 locations that would exceed the 66-dBA NAC level already experience noise levels at or above this threshold. (One location that exceeds the threshold under existing conditions – Location 6 – would fall below it under Alternative 4, although not under No Action conditions). It is important to note that because the noise modeling did not consider the high ambient levels of aircraft noise at the plaza location, the actual increases in ambient noise levels caused by increases in traffic would be lower than presented in Table G-3.

4.5.2.3 Mitigation Measures

FHWA requires that feasible and reasonable noise-abatement measures be considered to mitigate a noise impact on developed lands if the predicted traffic noise level approaches or exceeds the FHWA NAC, which is the case for this alternative, or if a significant noise increase (i.e., 6 dBA or more) over existing levels would occur, which is not the case for this alternative. Traffic noise abatement measures that could be used to mitigate impacts include:

- Designing the proposed deck over the Potomac Freeway so that there is no gap between the Columbia Plaza retaining wall and the deck. If the deck extended to the retaining wall, there likely would be a smaller increase in sound levels above existing-condition levels under Alternative 4. However, the cost of extending the deck likely would not be proportionate to the noise reduction achieved. Moreover, it would address 66 dBA NAC-level exceedance only in the vicinity of Columbia Plaza, leaving other locations experiencing noise levels above the threshold unmitigated.
- Applying traffic-management measures, such as prohibition of corridor traffic or enforcement of low traveling speeds, which sometimes are feasible for noise abatement. However, this is not practical on local streets, the Rock Creek Parkway, or Potomac Freeway, which serve as major traffic routes in the city.
- Altering horizontal alignments and vertical profiles of relevant roadways. In this case, alignment alteration for noise mitigation purposes is not feasible, since the roadway network for both local streets and highways is in place.
- Creating buffer zones through acquisition of property. Where unimproved property adjoins the corridor and adverse noise impacts are forecasted to extend beyond the roadway right-of-way, consideration can be given to establishing a buffer between the road and impacted receptors. In this case, however, since the affected receptors are adjacent to either major local roadways or highways, no buffer area can be created.
- Installing noise barriers. This measure is not reasonable or feasible for either the local roadway network or highways for three principal reasons:
 1. According to FHWA guidance, a reasonable abatement measure is considered to be one able to provide a minimum reduction of at least seven dBA at the affected property. In order to achieve such a reduction, a noise barrier has to be tall enough and wide enough to block the line of sight from all major traffic routes to the affected receptor. Because of the complexity and expansiveness of the road network in the project area, most of the affected receptors are surrounded by several heavily-traveled roadways that would all contribute to the projected exceedance.

2. Building noise barriers capable of blocking all lines of sight to surrounding traffic from each affected receptor would be beyond what can be considered reasonable or feasible because of the scale and cost of such barriers, and because of the safety risks and the negative visual and functional impacts they would create.
3. The National Park Service has stated its opposition to the construction of noise barriers for this project because of their negative effect on existing visual qualities of National Park Service lands, and because of the possibility that their structural foundations could affect buried cultural resources in the area near Rock Creek (Blumenthal, 2003).

In the North Sector, Locations 1 and 8 (see Appendix A, Figure 3.5-1), and Locations 1-1, 1-3, 1-5, 1-6 and 1-7 (see Appendix A, Figure 3.5-2) would be affected by noise impacts. Most of these locations are National Park Service lands surrounded or edged by roadways; Location 8 is a playground. To achieve substantial noise reductions at these locations, it would be necessary to erect long, tall noise barriers along the Potomac Freeway and its ramps as well as along adjacent local roadways, such as Pennsylvania Avenue and K Street. But it would be impractical to construct barriers along the edge of local streets or freeway ramps, as this would create safety problems. Breaks in the barriers necessary for driveway access would reduce their effectiveness. Furthermore, the barriers would seriously disrupt the views to and from nearby city streets and open spaces.

In the Center Sector, several locations would be affected by noise impacts. Impacts at Location 2-4 (see Appendix A, Figure 3.5-2) would result mostly from traffic on the Rock Creek Parkway. To mitigate this impact, a noise barrier would have to be built along the east side of the parkway, which would block the views over the Potomac River and Roosevelt Island from the parkway, which is a National Park Service property, and from the areas of the Watergate complex grounds, creating major adverse visual impacts.

In the vicinity of the Kennedy Center, the following locations would experience noise levels exceeding 66 dBA: Location 6 in the morning peak (see Appendix A, Figure 3.5-1) and Locations 3-1 in the morning peak, 3-3 in both the morning and evening peaks, and 3-8 in the evening peak (see Appendix A, Figure 3.5-2). These exceedances would primarily result from Rock Creek Parkway and Roosevelt Bridge traffic. Constructing a tall and wide barrier along the west side of Rock Creek Parkway would likely be able to achieve substantial noise reduction at these locations, but such a barrier would create major adverse visual impacts along the Rock Creek Parkway. In particular, it would disrupt important vistas over the Potomac River and Georgetown. As noted above, such visual intrusion is considered unacceptable by the National Park Service.

East of the Kennedy Center, Locations 9, 11, and 12 in the morning and evening peak periods (see Appendix A, Figure 3.5-1), Location 4-3 in the morning and evening peaks, and Locations 4-6 and 4-7 in the evening peak (see Appendix A, Figure 3.5-2) would experience exceedances. The affected area includes residences (the Columbia Plaza apartment complex). The main source of noise is traffic from the Potomac Freeway and other adjacent roadways, such as Virginia Avenue. As the freeway would lie on average approximately 30 feet below street level, retaining walls extending to the street level would have to be built. To achieve substantial noise reduction at ground-level receptors, noise barriers would have to be erected along the freeway. Building such walls – a typical

barrier can be 24 feet high – on top of retaining walls would be difficult and add greatly to construction costs. Furthermore, even such walls would make a difference only for those residences located on the lower stories of the apartment complex, and would not block the line of sight to the traffic from the upper floors. The walls would also block the view to the west from the lower floors of the apartment complex, resulting in major adverse visual impacts.

In the South Sector, exceedances would be experienced at Locations 5-1 and 5-6 in the morning and evening peak periods, and at Locations 5-2 and 5-4 in the evening peak (see Appendix A, Figure 3.5-2). These locations are within or near West Potomac Park, a National Park Service property listed in the National Register of Historic Places. Noise is mostly due to traffic on adjacent roadways, such as the Rock Creek Parkway, Ohio Drive, and the ramps associated with the Roosevelt Bridge. Constructing noise barriers along these roadways would result in visual impacts that would be unacceptable to the National Park Service and would seriously disrupt access to and use of the park.

4.5.3 Alternative 4V

Potential changes in traffic noise levels under Alternative 4V compared to the existing conditions were modeled using the TNM model, as was done for Alternative 4. The major roadway improvements (see Appendix A, Figures 2-15, 2-16, 2-17, and 2-18) under this alternative include:

- The northern side of the ramp realignment near 27th Street.
- The northern side of the new interchange between Potomac Freeway and Rock Creek Parkway.
- The vertical and horizontal realignment underneath the plaza.
- The local roadway interchange on the upper level of the plaza.
- The southern side of the new interchange near Ohio Drive.

The model-predicted Alternative 4V noise levels are shown in Appendix G, Table G-4. they indicate that noise levels in general would be similar to those under Alternative 4:

- The potential increases in noise levels above the existing conditions would not be exceed 6 dBA at any receptor locations, and therefore, ***no significant traffic noise impacts would result from Alternative 4V.***
- By Condition 2, however, ***traffic noise impacts would occur under Alternative 4V***, since predictions exceed the NAC levels at 18 receptor locations for the morning peak and 17 receptor locations for the evening peak.

At those locations where predicted noise levels would exceed the 66-dBA threshold, this exceedance already occurs under No Action conditions, with one exception in the morning peak – Location 2-9 – and three exceptions in the evening peak – Locations 11, 2-10, and 4-5 (see Appendix A, Figures 4.5-1 and 4.5-2). Under existing conditions, 13 of the 18 locations that would exceed the 66-dBA NAC level in the morning peak already experience noise levels equal to or above this threshold.

Location 5-6, which exceeds the threshold under both existing and No Action conditions, would improve to 5.9 dBA. In the evening peak, 11 of the 17 locations that would exceed the 66-dBA NAC level already experience noise levels at or above this threshold. Two locations – 6 and 5-1 – would improve from exceedance levels under both existing and No Action conditions to levels that are below the threshold. Once again, it should be noted that, because the noise modeling did not consider the high ambient levels of aircraft noise at the plaza location, the actual increases in ambient noise levels caused by increases in traffic would be lower than presented in Table G-4.

The same considerations with respect to the difficulty of applying mitigation measures that were noted above for Alternative 4 would apply to Alternative 4V, with an additional caveat – the mitigation measure that would consist of extending the deck to the Columbia Plaza retaining wall would negatively affect the architectural integrity of the plaza design conceived by architect Viñoly.

4.6 Park Lands and Memorials

This subchapter summarizes the impacts of the two action alternatives on National Park Service parkland and memorials in the study area. A Section 4(f) Evaluation is included as Appendix H in the *Technical Information* volume in response to the requirements of Section 4(f) of the US Department of Transportation Act of 1966 (49 USC 303), as amended.

4.6.1 Impacts on Parks in Study Area

4.6.1.1 No Action Alternative

The No Action Alternative would have no effect on parks in the study area. Existing conditions related to the No Action Alternative are described in Subchapter 3.6.

4.6.1.2 Alternative 4

The elements of Alternative 4 that would have direct, long-term impacts on National Park Service lands are described below by park area and then broken down by KCAI project sector. The second and third columns of Table 4.6-1 indicate the net change in parkland acreage that would result from the roadway work associated with each alternative. Negative changes indicate that parkland would be taken to create new roadway; positive changes indicate that more parkland would be created than taken for the project. In all cases, the new roadway proposed is adjacent to or near the existing roadway and within existing roadway corridors.

As the second column of Table 4.6-1 shows, there would be a net gain in parkland overall under Alternative 4. The following Appendix A figures illustrate the areas where parkland would be taken and where it would be replaced: Figures 4.6-1 (Direct Impacts on National Park Service Land, Alternative 4), 4.6-2 (Direct Impacts on National Park Service Land, Alternative 4, North Sector), 4.6-3 (Direct Impacts on National Park Service Land, Alternative 4, Center Sector), and 4.6-4 (Direct Impacts on National Park Service Land, Alternative 4, South Sector).

All proposed construction projects would generate short-term impacts, which might include temporary disruption of park activities, rerouting of pedestrian, bicycle and motorized vehicles, dust, noise, and soil erosion. The length and extent of these disturbances would vary by project element. Measures taken to mitigate construction impacts would include the following:

- Controlling soil erosion and dust by following NPS soil erosion control guidance.
- Protecting nearby trees and replacing affected landscaping.
- Restricting working hours to avoid disruptive noise levels during periods of active use.
- Maintaining traffic and pathways.

Subchapter 4.14 further describes short-term, temporary, construction-related impacts.

Table 4.6-1
Net Change in Parkland
(acres)

KCAI Project Sector (Park)	Alternative 4	Alternative 4V	Riverfront Connection and Wharf	No Action Alternative
North Sector (Rock Creek Parkway)	- 0.227	+ 0.063	N/A	0
Center Sector (L'Enfant Res. 720, 103, 104)	+ 0.430	+ 0.142	Net Increase (design- dependent)	0
South Sector (West Potomac Park)	+ 0.116	+ 0.482	N/A	0
Total	+ 0.319	+ 0.687	Net Increase	0

Rock Creek Parkway/Chesapeake and Ohio Canal National Historical Park

North Sector

Alternative 4 would improve three facilities in the Rock Creek Parkway/C&O Canal National Historical Park in the North Sector:

1. Pedestrian/Bicycle Trail Connecting Georgetown Waterfront with Rock Creek Parkway Trail. Alternative 4 would upgrade an existing pathway to create a paved pedestrian/bicycle trail connecting the bridge over Rock Creek serving Thompson's Boathouse with the Rock Creek Parkway Trail. The new paved, lighted, trail segment would follow an alignment as shown in Appendix A, Figure 2-13. The existing bridge across Rock Creek has curbs delimiting a three-foot-wide pedestrian walk on one side and a narrow strip on the other. Pedestrians now pick their way along this pathway, but the proposed paved pedestrian/bicycle trail would provide a more visible, signed, lighted, and safer traveling experience.

Connecting these two trails is in keeping with Georgetown Waterfront Park planning (NPS, 1987 and now being updated) and would provide a segment of the long-sought direct pedestrian and bicycle access from Georgetown to the Kennedy Center and the National Mall along the Rock

Creek Parkway Trail. By improving access to and along the Potomac River, this proposal is also in keeping with NCPC's *Extending the Legacy* plan (NCPC, 1997) and *Washington Waterfronts Plan* (NCPC, 1999).

The trail would provide a new recreational amenity in the Thompson's Boathouse area, which is designated in the *Rock Creek Park and the Rock Creek and Potomac Parkway Draft General Management Plan Environmental Impact Statement* (NPS, 2003) as an "urban recreation area." Construction of the trail would be consistent with the use and highly-developed nature of the boathouse site.

For those who now walk to the boathouse, a new trail from the bridge over Rock Creek to the Rock Creek Parkway Trail would eliminate the current conflicts between motorists who drive into the parking lot and over the bridge to pick up and drop off passengers and pedestrians (often in school groups) who occupy the same roadways. Access for those on foot or on bicycles from Georgetown to the Kennedy Center and the National Mall would be facilitated by this new trail connection.

2. Virginia Avenue/Rock Creek Parkway Intersection. In consultation with NPS, changes would be made to this intersection to improve pedestrian and bicycle movements and safety. These changes would benefit the many pedestrians and bicyclists who now cross the parkway at this point. Access to the Kennedy Center for those arriving on foot or by bicycle would be improved, as would access for those wishing to use the new trail connecting to Georgetown as well as the existing Rock Creek Parkway Trail.

3. Ramps to Connect Rock Creek Parkway Directly with the Potomac Freeway in the North Sector. Construction of new ramps (described in Subchapter 2.5.2.1 for Alternative 4) to connect directly the parkway with the Potomac Freeway would require converting parkland adjacent to the existing Rock Creek Parkway and associated ramps into pavement, but it would also remove existing roadway pavement to replace it with landscaping. While there would be a net gain in parkland for the whole of Alternative 4, as may be seen in Appendix A, Figures 4.6-1 and 4.6-2 and in Table 4.6-1 above, Alternative 4 in the North Sector would take 0.227 more acres of parkland than it would replace. This is the result of the proposed new connection between the freeway and parkway.

Because the primary use of the Rock Creek Parkway is for motorists and trail-users to enjoy the park setting, scenery, landscaping, and vistas across the Potomac River, the land converted to roadway would not change the park or recreational uses of the land. The parkway is eligible for listing in the National Register of Historic Places, and this project would not affect its eligibility.

Proposed construction activity or construction-related activity that would occur in this area during implementation of Alternative 4 access improvements would constitute an adverse impact to known and potential archaeological resources of national importance (see Subchapters 3.7 and 4.7). FHWA, in conjunction with NPS and the District of Columbia Historic Preservation Officer (DCSHPO), is preparing a memorandum of agreement concerning archaeological survey work that would take place during the design phase of the project, in response to Section 106 of the National Historic Preservation Act.

Center Sector

As described in Chapter 2, construction of a connection from the Kennedy Center River Terrace to

the Rock Creek Parkway Trail, a wharf over the river, and a floating dock would have effects on Rock Creek Parkway as a parkway and a recreational facility. Although the landings for the structures for the connection would require small amounts of NPS land, the proposed Center-to-riverfront connection, wharf, and dock would improve pedestrian access to the Rock Creek Parkway Trail, add recreational amenities to this part of the park, enhance access to the river, and create new public space on the wharf structure.

The connection from the Kennedy Center River Terrace to the riverfront has the potential to increase the tunnel effect parkway drivers now experience when driving under the River Terrace, which is cantilevered over the northbound parkway lanes. Depending on the final design, potential negative effects might include:

- Partially blocking views of the Georgetown waterfront and river traffic that northbound drivers now experience.
- Partially blocking views of Roosevelt Island, the Roosevelt Bridge and river traffic that southbound drivers now experience.
- Adding to the existing tunnel effect.
- Decreasing the amount of natural light reaching the parkway.

Coordination among FHWA, NPS, the Kennedy Center, CFA and NCPC would be needed during the design phase to ensure that these potential negative effects are minimized.

Depending upon the final design of the wharf and the Center-to-riverfront connection, up to 7,500 square feet of new public space would be created, plus the floating dock. Precise calculation of the amount of land taken by the connection and the amount created by the wharf is not possible at this time because the stair designs illustrated in this EA are schematic examples rather than actual designs. The final design for the connection would affect the amount of land needed for structural landings and the size of the wharf required to allow passage for Rock Creek Parkway Trail users and dock users. Careful planning would be needed to ensure that pedestrians using the Center-to-riverfront connection, trail users, and those arriving and leaving by boat do not conflict with each other. Adding the wharf provides more room in this area to sort out these uses.

The connection between the Kennedy Center and the Rock Creek Parkway Trail would provide pedestrians with a new pathway that does not now exist. The connection would create a physical link between the Center and the Potomac River and create long-term positive impacts on the ability of pedestrians to access the Center from the river.

The addition of a floating dock would have several beneficial effects. NCPC's *Extending the Legacy* (1997) and *Washington's Waterfronts* (1999) plans envision a dock at the Kennedy Center and a water taxi system serving this part of the Potomac River to make it an attractive destination and resource for the region. Adding a dock in front of the Kennedy Center would support this vision and encourage such a public transit service. A dock could also allow tour boats to drop off and pick up tourists who might visit the Kennedy Center as a presidential memorial and/or to attend performances. Increasing active use of the riverfront is also a goal of the Georgetown Waterfront planning effort that is going on now.

Increasing the attractiveness of this part of the river for boats would be an indirect, long-term impact of adding a floating dock. Nearby Thompson's Boathouse generates a considerable amount of boat traffic from the schools and universities that base their rowing teams there, as well as from the boathouse's boat rental service. While it might seem that adding a dock at the Kennedy Center could lead to more conflicts between motorized and non-motorized boaters – raising the possibility of water taxis dodging rowers and kayakers – the river is about 875 feet wide at this location, and two of the heaviest users of the boathouse are planning to move upriver to their own boathouses: the George Washington University and Georgetown University rowing teams. Particularly on pleasant days, tour-boats and large numbers of private motorized boats already ply the river near the Kennedy Center to view the scenery and to dock at Washington Harbour in Georgetown. By comparison, in Baltimore Harbor, several water-taxi services operate successfully alongside paddleboats, sailboats for tourists, and public and private motorized boats in much tighter quarters. Ultimately, the viability and feasibility of water-taxi service would need to be examined before such a service would begin.

West Potomac Park

Improvements in West Potomac Park include both roadways and pedestrian/bicycle ways.

Roadway Improvements

In West Potomac Park, realigning existing roads and building a bridge to carry Potomac Freeway traffic over Ohio Drive would add pavement in some areas and remove it in others, with a net result of 0.116 acres of roadway being converted to parkland (see Appendix A, Figure 4.6-4). Depending upon the final design, a number of trees and woody shrubs near the road sections to be realigned might be removed. Under Alternative 4, long-term passive recreational use of West Potomac Park by parkway drivers would not change. However, access to the Kennedy Center would be facilitated for the more than 40 percent of Center patrons who use this route to reach the Center from Virginia. No longer would there be delays and backups onto Roosevelt Bridge for those attempting to turn onto the parkway.

The values that make West Potomac Park a National Register historic site would not be affected by the adjustments to the existing roadway or pedestrian/bicycle facilities. In the long term, it is not anticipated that the use of nearby volleyball courts would be affected by this action. During construction, short-term noise levels, dust, and traffic re-routings would occur, but the impacts would be partially mitigated by using best management practices to control dust and restricting work hours when recreational fields are in use. Short-term, construction-related impacts are described further in Subchapter 4.14.

Pedestrian/Bicycle Way Improvements

Paved trails would be built in the South Sector to improve pedestrian and bicycle access to and from the Kennedy Center, the Roosevelt Bridge, and the National Mall, as described in Subchapter 2.5.2.3. Appendix A, Figure 2-13 illustrates the proposed combined pedestrian/bicycle trails. Within the boundaries of West Potomac Park, about 1,400 feet of new, paved 10-foot-wide pedestrian/bicycle trail would be provided parallel to the proposed realignment of the ramp from the bridge to Ohio Drive. This trail would then turn back to the west, loop beneath the exit ramp,

and rise to a new overpass structure cantilevered off the existing bridge. From there, it would continue on this cantilevered structure across the Potomac Freeway and then down to 23rd Street and Constitution Avenue, thus eliminating the dangerous at-grade crossing of the Potomac Freeway. At this point users would enter the Washington street grid system and circulate on existing sidewalks. A final trail connection between Rock Creek Parkway and the Belvedere is also provided at the base of the loop return prior to its passing under the ramp. The existing pedestrian path connecting 23rd Street to the Roosevelt Bridge would be demolished.

Construction of this trail would improve pedestrian and bicycle access and safety for those wishing to reach the Kennedy Center via the Roosevelt Bridge or reach the Rock Creek Parkway Trail from 23rd Street, Constitution Avenue, and the National Mall. About one-third of the trail's length would be elevated. The remaining two-thirds would be at grade and require 0.321 acres of land through the park. An existing asphalt trail would be demolished, so that the net new construction would require 0.09 acres in West Potomac Park, including land under a bridge structure. The addition of the trail would benefit park users and is in keeping with the park's current uses.

L'Enfant Plan Reservations

As may be seen in Appendix A, Figure 4.6-3 and in Table 4.6-1 above, 0.430 acres of NPS land in L'Enfant Plan Reservations 720, 103, and 104 would be converted from roadway to parkland by the removal of the existing ramps. Therefore, positive direct long-term impacts to NPS lands would result from these proposed changes.

NPS Reservations 720 (the site of the Gálvez statue), 103, and 104, which are near the Virginia Avenue and E Street intersection (see Appendix A, Figure 3.6-1), would be adversely affected in the short-term by construction, as would Reservation 106 at the Virginia Avenue and 21st Street intersection. Removal of the E Street Expressway ramp to Virginia Avenue just north of the U.S. State Department and reconstruction of the E Street Expressway tunnel to accommodate an additional lane of traffic (see Appendix A, Figures 2-10 and 4-6.3) would cause considerable disruption. While demolishing the ramp up to Virginia Avenue alone would not cause much disruption, reopening the cut-and-cover tunnel and widening it would affect everything on top of and near the tunnel from 23rd to 21st Streets.

About 2.6 acres of land, some of it owned and managed by NPS, would be temporarily disturbed by construction. Reopening the cut-and-cover tunnel would require moving the Gálvez Statue and whatever landscaping could be salvaged into storage, and permanently removing the remainder of the landscape trees, woody shrubs, and planting beds. It would take many years for new trees to reach the heights of the mature landscape trees now in the affected area. Mitigation of these impacts would include rebuilding and re-landscaping the NPS reservations on the restored cover over the E Street Expressway. This action would replicate the planning and construction that occurred when the parks were first built following construction of the E Street Expressway.

4.6.1.3 Alternative 4V

Table 4.6-1 above shows the net changes in parkland for this alternative. Changes are illustrated in Appendix A, Figures 4.6-5 (Direct Impacts on National Park Service Land, Alternative 4V), 4.6-6 (Direct Impacts on National Park Service Land, Alternative 4V, North Sector), 4.6-7 (Direct

Impacts on National Park Service Land, Alternative 4V, Center Sector), and 4.6-8 (Direct Impacts on National Park Service Land, Alternative 4V, South Sector).

Rock Creek Parkway/ Chesapeake and Ohio Canal National Historical Park

Like Alternative 4, Alternative 4V would improve three facilities in the Rock Creek and Potomac Parkway/C&O Canal National Historical Park in the North Sector:

1. Pedestrian/Bicycle Trail Connecting Georgetown Waterfront with Rock Creek Parkway Trail. The design and the impacts of this trail connection would be the same as described under Alternative 4.

2. Virginia Avenue/Rock Creek Parkway Intersection. Improvements to this intersection would be the same as described under Alternative 4.

3. Ramps to Connect Rock Creek Parkway Directly with the Potomac Freeway in the North Sector. Under Alternative 4V, the new connections between Rock Creek Parkway and the Potomac Freeway (see Appendix A, Figures 2-14 and 4.6-6, and the description of the design in Subchapter 2.5.3.2) would result in a net conversion of 0.063 acres of roadway into parkland. The use of the parkway would not change under this alternative. The short-term construction-related impacts described in Subchapter 4.14 would be more disturbing to park use and operations than would the final resulting roadway improvements.

Proposed construction activity or construction-related activity that would occur in this area during the implementation of Alternative 4V improvements would constitute an adverse impact to known and potential archaeological resources of national importance (see Subchapters 3.7 and 4.7). FHWA, in conjunction with NPS and the DCSHPO, is preparing a memorandum of agreement concerning archaeological survey work that would take place during the design phase of the project, in response to Section 106 of the National Historic Preservation Act.

West Potomac Park

Impacts would be the same as described under Alternative 4, with the exception that the wharf would be curved and the total area created would be less than under Alternative 4 (see Appendix A, Figure 2-15).

L'Enfant Plan Reservations

As may be seen in Appendix A, Figure 4.6-7 and in Table 4.6-1 above, 0.142 acres of NPS land in L'Enfant Plan Reservations 720, 103, and 104 would be converted from roadway to parkland by the removal of the existing ramps. Therefore, positive, long-term impacts to NPS lands would result from these proposed changes.

Because Alternative 4V does not include removing the ramp from eastbound E Street Expressway to Virginia Avenue, reconstruction of the E Street Expressway tunnel to replace the capacity lost by removing the ramp would not be necessary (see Appendix A, Figures 2-15 and 4.6-7). Consequently, short-term construction-related impacts would affect only about 0.3 acres of NPS Reservations 720

and 104, as opposed to the 2.6 acres that would be disturbed for construction of Alternative 4. The land affected would be concentrated over the E Street Expressway just west of where it crosses under Virginia Avenue. The impacts would be similar to those described for Alternative 4 but much reduced in scale and duration.

4.6.1.4 Summary of Impacts and Mitigation

Overall, the amount of parkland and open space in the study area would increase if the proposed action were implemented. The proposed road improvements under both action alternatives would result in a small net increase in parkland (about a third of an acre for Alternative 4 and two-thirds of an acre for Alternative 4V) on NPS lands. The proposed wharf facility needed to accommodate the connection from the Kennedy Center to the riverfront would create more public space (about one-sixth of an acre for the rectangular wharf, less for the bowed wharf).

The proposed plaza would create a deck with a large expanse of open space that could be landscaped and might include fountains and plazas. Under Alternative 4 as shown, five and two-thirds acres of green space would be created – about three acres in the central plaza that extends west on E Street, and about two and two-thirds acres around the proposed buildings. For Alternative 4V, about three and one-half acres would be created – two and one-half acres in the central plaza and fountain area and one acre around the proposed buildings. While the final design and ownership of the plaza is not certain, the plaza would become a functioning part of the parkland in the study area.

The proposed pedestrian/bicycle trail improvements would upgrade existing facilities and provide direct long-term benefits to park users by improving user access and safety. As such, they represent enhancements to Rock Creek Parkway and to West Potomac Park.

The proposed connection from the Kennedy Center River Terrace to the riverfront, along with the wharf and floating dock, would provide new recreational facilities along the riverfront and improve pedestrian access from a presidential memorial to a heavily-used trail. The floating dock would provide a new means of access to the Kennedy Center as well as a resource for boaters on the river. Special design efforts to preclude a tunnel effect on the parkway would be undertaken.

Mitigation measures agreed to by NPS are listed in Appendix H (Section 4(f) Evaluation). These include: creating more parkland than is taken for roadway improvements; building two new trails in Rock Creek Parkway and West Potomac Park; and, if the bridge to carry Potomac Freeway traffic over Ohio Drive is selected (Alternative 4), carefully designing the bridge in a context-sensitive manner befitting its location near the Lincoln Memorial.

As design progresses, FHWA would work with NPS to develop plans to mitigate short-term construction-related impacts on NPS parklands affected by the proposed action. Subchapter 4.14 addresses construction impacts. Mitigation measures would include: soil erosion control plans and use of best management practices; clearly defining construction staging areas and access routes; protecting vegetation from construction equipment; establishing hours of operation; planning for road and trail closures and detours; and replanting landscaping lost by construction.

4.6.2 Impacts on Memorials and Monuments

4.6.2.1 No Action Alternative

The No Action Alternative would have no effect on memorials and monuments. It would neither disturb existing structures nor provide space for new ones.

4.6.2.2 Alternative 4

Alternative 4 would facilitate redevelopment of Memorial Site 11 (shown in Appendix A, Figure 3.6-2 and discussed in Subchapter 3.6.5.1 and Appendix D, Section D9), which is in line with the recommendations of the *Memorials and Monuments Master Plan* (NCPC, 2001). Because reconstruction of the E Street Expressway would extend into Reservation 106, demolition of existing landscaping and hard surfaces would be required, along with restoration following reconstruction of the cut-and-cover E Street Expressway tunnel.

Consistent with the *Memorials and Monuments Master Plan*, the proposed Kennedy Center plaza would offer a space that could be used for Proposed Memorial Site 2, which is now sited over the Potomac Freeway. Only by building the deck atop the freeway and the plaza on its surface could this memorial site be used.

Pedestrian and bicycle access to Proposed Monument Site 6, south of the Roosevelt Bridge ramps and near the Belvedere, would be greatly enhanced by the pedestrian improvements proposed under Alternative 4. At present, this site is relatively inaccessible on foot.

4.6.2.3 Alternative 4V

Because reconstruction along the E Street Expressway would be much less extensive and would not extend into Reservation 106, this alternative would not directly facilitate construction of Proposed Memorial Site 11. However, by requiring reconstruction of nearby Reservations 720 and 104, this proposed action might provide the impetus for further action on this neighboring reservation to the east.

The impacts on Proposed Memorial Sites 2 and 6 would be similar to those described under Alternative 4. One potential exception is that the Viñoly design for the plaza, at this early conceptual stage, creates a smaller open space that the architect envisions using for a cascading fountain. Unless the fountain itself becomes the memorial site, locating one in this more restricted space could prove difficult.

4.7 Cultural Resources

Section 106 of NHPA requires that federal agencies take into account the effects of their actions on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places. Implementing regulations for Section 106 established by the Advisory Council on Historic Preservation are contained in 36 CFR Part 800; Protection of Historic

Properties. These regulations provide specific criteria for assessing the effects, in particular adverse effects, of federal undertakings on historic properties. The anticipated consequences on a cultural resource that result from proposed actions under an alternative are examined, as well as important characteristics of the impacted resource itself. Effects on cultural resources that are listed in, or eligible for listing in, the National Register of Historic Places are evaluated based on Criteria of Effect and Adverse Effect set forth in 36 CFR 800.9 and listed in Table 4.7-1.

Table 4.7-1
Criteria of Adverse Effect

Criteria of Adverse Effect	
<p>"An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative" (36 CFR 800.5[a][1]).</p>	
Examples of Adverse Effect	
<p>"Adverse effects on historic properties include, but are not limited to:</p> <ol style="list-style-type: none"> 1. Physical destruction of or damage to all or part of the property; 2. Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR Part 68) and applicable guidelines; 3. Removal of the property from its historic location; 4. Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance; 5. Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features; 6. Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; 7. Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance" (36 CFR 800.5[a][2]). 	

4.7.1 Archaeological Resources

All potential impacts on archaeological resources are construction-related. However, because they potentially could be major and long-term, they are discussed here rather than in Subchapter 4.14. Impacts considered include impacts from demolition of extant roads and ramps at or below grade, construction of roads and ramps at or below grade, and building construction at or below grade. Equipment staging areas, equipment storage areas, and temporary traffic lanes represent construction-related activities that may impact known and/or potential archaeological resources. Ancillary disturbances may also occur in areas where improvements to traffic flow along existing transportation corridors are proposed, even if no major construction work is involved. Finally,

subsurface disturbances associated with the installation of signage, guardrails, dedicated turn lanes, storm drains, drainage conduits, lighting, and signalization also could impact known and/or potential archaeological resources.

4.7.1.1 Summary of Known and Potential Resources

Known Archaeological Resources

As discussed more at length in Subchapter 3.7.3, six National Register-eligible archaeological sites have been identified in the North Sector in the vicinity of the Whitehurst Freeway within historic Squares 1, 4, and 5 (see Appendix A, Figure 3.7-2; historic City Squares are shown in Appendix A, Figure 3.7-1). The sites date to both prehistoric and historic times and were intact beneath varying depths of historic and modern fill deposits. Three of these National Register-eligible sites have been partially excavated as part of a prior Phase 3 archaeological survey. These sites are:

- The historic Peter House site, located southeast of the Whitehurst Freeway/27th Street intersection, between 27th Street and the Potomac Freeway, in historic City Square 5.
- The Whitehurst West prehistoric site, located southwest of the Whitehurst Freeway/Rock Creek Parkway intersection, north of the overhead eastbound ramp connecting the Whitehurst Freeway to the southbound Potomac Freeway, in historic City Square 1.
- The Ramp 3 prehistoric site, located southwest of the Whitehurst Freeway/27th Street intersection, east of the northbound Rock Creek Parkway, north of the overhead eastbound ramp from the Whitehurst Freeway to the southbound Potomac Freeway, in historic City Square 1.

Three additional National Register-eligible sites have been identified and partially excavated during prior Phase 2 archaeological surveys. These three sites, dating to the prehistoric and historic periods, are located in the North Sector, within historic City Squares 1 and 4. These sites are:

- The Cammack and Decker Lime Works, located between the Rock Creek Parkway and 27th Street, south of the overhead eastbound ramp connecting the Whitehurst Freeway to the southbound Potomac Freeway, in the southern portion of historic City Square 1.
- The Hayman Brewery/Arlington Bottling Company site is located just northeast of the Whitehurst Freeway/27th Street intersection, within historic City Square 4.
- An unnamed Prehistoric Site, located to the northeast of the brewery site, northeast of the Whitehurst Freeway/27th Street intersection, near the overhead ramp connecting the Potomac Freeway to the westbound Whitehurst Freeway, within historic City Square 4.

Potential Archaeological Resources

Figure 3.7-2 in Appendix A highlights those areas considered to possess potential for archaeological resources. Such areas exist in the North and Center Sectors; the South Sector is considered to possess no potential for archaeological resources.

4.7.1.2 No Action Alternative

The No Action Alternative would have no impacts on known or potential archaeological resources in the study area, as no subsurface disturbances would occur. Redevelopment or new construction would not take place, and known and potential archaeological resources within the study area would remain intact.

4.7.1.3 Alternative 4

In the North Sector of the study area, Alternative 4 would require major construction and demolition activity, affecting portions of historic City Squares 1, 4, and 5 (see Appendix A, Figure 3.7-1). A direct connection between the Rock Creek Parkway and the Potomac Freeway would be established through the construction of two new ramps. The demolition of existing ramps is also proposed.

One of the proposed ramps would connect the Rock Creek Parkway to the southbound Potomac Freeway south of Whitehurst Freeway/K Street, crossing 27th Street at a signalized intersection. Demolition of the existing 27th Street ramp to the southbound Potomac Freeway is proposed. This action would affect archaeological resources within historic City Square 1.

Known archaeological resources are present in historic City Square 1 (see Appendix A, Figures 3.7-1 and 3.7-2). The construction of the new ramp would likely destroy the National Register-eligible prehistoric Ramp 3 site, just north of the Whitehurst Freeway overhead ramp. This site has been only partially excavated, and its boundaries have not been determined. The 1996 Phase 3 excavation was limited to the removal of a Middle Woodland period cremation burial site from its location, which was the site of a proposed piling or footing for the Whitehurst Freeway Rehabilitation Project. In addition, most of the area surrounding the Ramp 3 site has been determined to possess high potential for archaeological resources. This area is bounded by Rock Creek Parkway on the west, 27th Street on the east, a line approximately 30 feet south of K Street on the north, and the Whitehurst Freeway overhead ramp on the south. Proposed construction activity or construction-related activity in this area during the implementation of Alternative 4 access improvements would constitute an adverse impact to known and potential archaeological resources in this area.

The National Register-eligible historic Cammack and Decker Lime Works site is located just south of the Whitehurst Freeway overhead ramp, and may be impacted by construction activities and/or ancillary construction activities associated with the proposed new ramp under Alternative 4. The area between the Rock Creek Parkway on the west, 27th Street on the east, the Whitehurst Freeway overhead ramp on the north, and Virginia Avenue on the south has been determined to possess high potential for the presence of archaeological resources. Any construction activity or construction-related activity in this area during the implementation of Alternative 4 would constitute an adverse impact.

The other proposed ramp would connect the northbound Potomac Freeway to the northbound Rock Creek Parkway. It would be located east of 27th Street off the northbound Potomac Freeway, run beneath Whitehurst Freeway/K Street northward, connecting to Rock Creek Parkway at a signalized intersection along an existing ramp on the north side of the 27th Street/K Street intersection. The existing ramp connecting the Whitehurst Freeway/27th Street intersection with the

northbound Rock Creek Parkway would be demolished. This action would affect historic City Squares 4 and 5.

Known archaeological resources are present in historic City Square 4 (see Appendix A, Figures 3.7-1 and 3.7-2). The National Register-eligible Hayman's Brewery and Arlington Bottling Company site is located at the northeast corner of the intersection of Whitehurst Freeway/K Street and 27th Street. To the northeast of the brewery site is the National Register-eligible unnamed prehistoric site. The area around and between these two known resources has been determined to possess high potential for the presence of additional archaeological resources. The ramp construction and associated construction activities and/or ancillary construction activities during implementation of Alternative 4 would likely constitute an adverse impact on known and potential archaeological resources.

Known archaeological resources are present in historic City Square 5 (see Appendix A, Figures 3.7-1 and 3.7-2). South of Whitehurst Freeway/K Street and southeast of the intersection with 27th Street is the site of the National Register-eligible Peter House. This site consists of 18th and 19th century foundation remains atop a multi-component prehistoric site, located during a prior Phase 2 archaeological survey. Phase 3 excavations were conducted in 1996 on a portion of the Peter House site. The Phase 3 excavation was limited in scope to a specific impact corridor associated with the proposed Whitehurst Freeway Rehabilitation Project. It was determined during this survey that the easternmost portion of the 18th century Peter House had been impacted by previous construction activities, likely associated with the Potomac Freeway. The boundaries of the site to the north, west, and south were not determined during the Phase 3, for either the historic or prehistoric site component. Therefore, most of the area surrounding the Peter House site to the north, west and south is considered to have high potential for archaeological resources. The ramp construction and associated construction activities and/or ancillary construction activities during implementation of Alternative 4 would likely constitute an adverse impact on potential archaeological resources.

Under Alternative 4, a combined bicycle and pedestrian trail would be built to link the trail running along the Rock Creek Parkway to the Georgetown waterfront trail. The area to the east of Rock Creek/C & O Canal, west of historic square 1, is considered to possess high potential for archaeological resources. The construction activities associated with construction of the trail may adversely impact potential archaeological resources. Ancillary activities involved in such construction may also adversely impact potential archaeological resources in the area west of historic City Square 1, as well as within historic City Squares 1 and 2.

In the Center Sector, construction of the proposed deck and plaza construction would adversely affect the areas of low to moderate archaeological potential identified on the south side of F Street (on either side of the existing access tunnel to the underground parking facility). These areas are located within historic City Square 20.

4.7.1.4 Alternative 4V

In the North sector of the study area, Alternative 4V would require major construction and demolition activity. A direct connection between the Rock Creek Parkway and the Potomac Freeway would be established through the construction of a new ramp north of Whitehurst Freeway/K Street and new parallel roadways south of Whitehurst Freeway/K Street. The demolition of existing ramps is also proposed. The proposed action in the North Sector would affect portions of historic

City Squares 1, 4, and 5 (see Appendix A, Figure 3.7-1).

North of Whitehurst Freeway/K Street, a new ramp would be constructed utilizing a portion of the existing ramp to the northbound Rock Creek Parkway, where a signalized intersection would be installed. The southern portion of the existing ramp would be demolished and its connection to the Whitehurst Freeway/K Street/27th Street intersection would be eliminated. The new ramp would pass under Whitehurst Freeway/K Street, split into two parallel roadways, and connect to the Potomac Freeway. The easternmost roadway would connect to the northbound Potomac Freeway; the westernmost would connect to the southbound Potomac Freeway. The construction of the westernmost ramp would require an underpass beneath the easternmost ramp. Additional connections and improvements would be made at 27th Street to accommodate northbound Potomac Freeway traffic connecting to K Street and for southbound 27th Street traffic entering the Potomac Freeway. This action would impact historic City Squares 4 and 5.

Known archaeological resources are present in historic City Square 4 (see Appendix A, Figures 3.7-1 and 3.7-2). The National Register-eligible Hayman's Brewery and Arlington Bottling Company site is located at the northeast corner of the intersection of Whitehurst Freeway/K Street and 27th Street. To the northeast of the brewery site is the National Register-eligible unnamed prehistoric site. The area around and between these two known resources has been determined to possess high potential for the presence of additional archaeological resources. The ramp construction and associated construction activities and/or ancillary construction activities involved in the implementation of Alternative 4V would constitute an adverse impact on known and potential archaeological resources.

Known archaeological resources are present in historic City Square 5 (see Appendix A, Figures 3.7-1 and 3.7-2). South of Whitehurst Freeway/K Street and southeast of the intersection with 27th Street is the site of the National Register-eligible Thomas Peter House. This site consists of 18th and 19th century foundation remains atop a multi-component prehistoric site, located during a prior Phase 2 archaeological survey. Phase 3 excavations were conducted in 1996 on a portion of the Peter House site. The Phase 3 excavation was limited in scope to a specific impact corridor associated with the Whitehurst Freeway Rehabilitation Project. It was determined during this survey that the easternmost portion of the 18th century Peter House had been impacted by previous construction activities, likely associated with the Potomac Freeway. The boundaries of the site to the north, west, and south were not determined during the Phase 3, for either the historic or prehistoric site component. Therefore, most of the area surrounding the Peter House site to the north, west, and south is considered to have high potential for archaeological resources. The ramp construction and associated construction activities and/or ancillary construction activities involved in the implementation of Alternative 4V would constitute an adverse impact on potential archaeological resources.

The area to the east of Rock Creek/C & O Canal and west of historic City Square 1 is considered to possess high potential for archaeological resources. The construction activities associated with the installation of the proposed trail would require subsurface disturbances that may adversely impact potential archaeological resources. Ancillary activities involved in such construction may also adversely impact potential archaeological resources in the area west of historic City Square 1, as well as within historic City Squares 1 and 2.

In the Center Sector, the deck and plaza concept proposed under Alternative 4 would involve mostly the area immediately east of the Kennedy Center. This would not affect the area of low to

moderate archaeological potential located on the northern half of historic City Square 20 (i.e., on the south side of F Street, on either side of the existing access tunnel to the underground parking facility).

4.7.1.5 Mitigation Measures

Adverse impacts to archaeological resources in the North and Center sectors of the study area would be mitigated through measures stipulated in a Memorandum Of Agreement among FHWA, NPS, DDOT, and DCSHPO.

4.7.2 Architectural Resources

The Area of Potential Effect (APE) for the Kennedy Center Access Improvement project and the known historic architectural resources it contains are shown in Appendix A, Figure 3.7-3. The following impact analysis assesses effects on known resources that have either been listed on the National Register, determined eligible for listing on the National Register, or been designated DC Landmark properties.

4.7.2.1 Summary of Known Architectural Resources and Methodology

A summary list of the resources analyzed in this subchapter is provided below. More detailed descriptions are provided in Subchapter 3.7.5. The location of each resource is shown on Appendix A, Figure 3.7-3.

Category A Resources (National Register-Listed Resources/National Historic Landmarks/DC Landmarks)

- Georgetown Historic District.
- Old Naval Observatory.

Category B Resources (National Register-Listed/DC Landmark/National Historical Park)

- C&O Canal Historic District.

Category C Resources (National Register-Listed Resources/DC Landmarks)

- Foggy Bottom Historic District.
- Godey's Lime Kilns.
- American Institute of Pharmacy.
- West Potomac Park Historic District.
- Lincoln Memorial and Statue of Lincoln.
- Memorial Bridge (including the Watergate Steps and Terminus of Rock Creek Parkway).
- Theodore Roosevelt Island.
- L'Enfant Plan of the City of Washington.

Category D Resources (National Register-Eligible Resources)

- Potomac Naval Annex Historic District.
- 2430 E Street Buildings.
- Northwest Rectangle Historic District.

Category E Resources (DC Landmarks)

- Sweeney Plowman Houses (Cooper Houses).
- American Red Cross DC Chapter House.
- Rock Creek Parkway.

Because of the large number of historic resources in the APE, the following analysis is organized by type of impact rather than by resource. For the purpose of this analysis, four types of impact have been identified:

- **Physical impacts:** impacts that affect the resource itself. Examples would be complete or partial destruction of the resource, removal of the resource, alteration or change in the physical features of the resource or its immediate environment, etc. A physical impact is considered an adverse effect if it permanently diminishes the integrity of the property, as described in Table 4.7-1.
- **Visual impacts:** impacts that may affect the visual environment of the resource but not the physical integrity of the resource itself. Examples would be the blocking of an important vista from the resource by a new construction. A visual impact is considered an adverse effect if it permanently diminishes the integrity of the property, as described in Table 4.7-1.
- **Construction-related impacts:** impacts that would result from the construction work associated with the proposed action. Construction impacts are by definition temporary. Construction-related impacts on architectural resources are discussed in Subchapter 4.14.
- **No Impact::** assigned when the resource would not be affected in any of the ways described above.

Under each type of impact, only resources to which they apply are mentioned. When a resource is not mentioned under a type of impact, it means that the proposed action has no such impacts on the resource. For each resource under each type of impact, the impact is described and assessed as to whether it constitutes an adverse effect under Section 106. In most cases, the conclusion is a conditional “no adverse effect.” This means that the identified impact will not constitute an adverse effect provided the stated conditions are adhered to during project implementation.

4.7.2.2 No Action Alternative

Under the No Action Alternative, the sixteen historic resources and L’Enfant Plan within the APE would remain intact. There would be no impact of any kind.

4.7.2.3 Alternative 4

Physical Impacts

Alternative 4 would have physical impacts on three resources, as described below.

Rock Creek Parkway

The Rock Creek Parkway would be directly affected by the improvements proposed for the North Sector. Two new signalized intersections would be constructed linking the Potomac Freeway to the parkway. One of the ramps, which would connect the parkway with the freeway's southbound lane, would branch off the parkway at a new signalized intersection, creating a new access point to the parkway. While this action would impact the parkway, it would not constitute an adverse effect if the design and construction of the new ramp and access point are consistent with the current character of the parkway and its environment in this area.

The other proposed ramp would link the northbound lanes of the Potomac Freeway to the northbound lanes of the parkway. As it approaches the intersection with the parkway, this new ramp would overlap with an existing ramp. Thus, no new access point or physical impact to the parkway would be created.

In the Center Sector, the construction of the proposed stairs linking the Kennedy Center to the riverfront would also directly affect the parkway, as the new structure would span its entire width. This would block views of the river, Georgetown, and Roosevelt Island over approximately 300 feet. These views are an integral element of the experience provided by the parkway. This impact would not constitute an adverse effect if the stairs were designed in a manner sensitive to the historic parkway and any tunnel effect they could create.

Improvements proposed for the South Sector would not have any physical impacts on the parkway. Taken together with those proposed for the North Sector, roadway improvements under Alternative 4 are expected to redirect a substantial portion of the commuter traffic currently using the Rock Creek Parkway to the Potomac Freeway. As a result, the portion of the parkway between the Belvedere and Virginia Avenue would become a safer and more enjoyable route for those motorists choosing to use it. Pedestrians and bicyclists using the trail that runs between the parkway and the river would also benefit from this change.

West Potomac Park Historic District

Alternative 4 would have a direct impact on West Potomac Park in the South Sector of the study area.

Under Alternative 4, the existing intersection of Ohio Drive and the Potomac Freeway, in West Potomac Park, would be replaced by a grade-separated interchange. The southbound Potomac Freeway would pass over Ohio Drive, which would be lowered to limit the height of the overpass. Additionally, the buttonhook linking the Roosevelt Bridge eastbound to the Rock Creek Parkway northbound would be moved a short distance to the west of its current position and a dedicated lane would be built, allowing traffic to enter the parkway without having to merge.

The proposed improvements would not cause functional changes, because they would only modify and improve existing intersections and roadway connections. Roadways and traffic ramps functionally and visually dominate the section of the park affected by the Alternative 4 improvements. However, the proposed overpass would be a new structure that, because it would be elevated, would be visible from afar and have the potential to alter the appearance and feel of the park in that area. Construction of the new overpass would not amount to an adverse effect if it is built and designed in a context-sensitive manner, with particular attention to nearby resources such as the Lincoln Memorial and Memorial Bridge.

The pedestrian/bicycle improvements in the South Sector proposed under Alternative 4, including relocation of some pedestrian walkways, would make the park more easily accessible to visitors and enhance it through better connection to surrounding sites, including the Kennedy Center.

L'Enfant Plan of the City of Washington

Alternative 4 would result in several changes to the L'Enfant Plan as it exists today. In the North Sector, construction of a new ramp between the Rock Creek Parkway and the Potomac Freeway would affect 27th Street, which the new ramp would intersect south of K Street. However, at this location, 27th Street has little character and integrity, and looks and functions more like a traffic ramp than an urban street. The creation of a new intersection would not amount to an adverse effect on the L'Enfant Plan, provided it is designed in a context-sensitive manner.

In the Center Sector, Alternative 4 would substantially and directly affect the L'Enfant Plan through the proposed construction of a new plaza with room for two symmetrically-placed, square-plan buildings, separated by open space and a fountain, east of the Kennedy Center and in the axis of E Street. This action would create a new reservation within the L'Enfant Plan. Currently, the L'Enfant Plan along the E Street Expressway and Potomac Freeway lacks integrity because it is dominated by modern freeways and expressways that break through the intersecting and diagonal streets of the historic plan. The proposed deck along E Street and over the E Street Expressway west of 23rd Street and the Potomac Freeway to the Kennedy Center would improve the functional and visual relationship between the plan and the Center and re-establish historic connections that were lost when the present freeways were built. The proposed extension of 25th Street on the deck would recreate a link with E Street, thus repairing an element of the historic city grid. These improvements would amount to a major positive effect on the L'Enfant Plan, the integrity of which would be partially restored.

East of 23rd Street, Alternative 4 would eliminate the ramp linking the eastbound E Street Expressway to Virginia Avenue along the northern edge of the U.S. State Department. Although the ramp is not part of the L'Enfant Plan, as it approaches Virginia Avenue it merges with D Street, which is part of the plan (see Appendix A, Figure 3.7-3). The proposed action might result in the removal of the connection between D Street and Virginia Avenue. However, at this location, D Street has little integrity, as it functions mainly as an alley along the northern side of the U.S. State Department, which is closed to public access for security reasons. The intersection with Virginia Avenue appears to have been altered, probably when the E Street Expressway ramp was built. Removal of the intersection would not constitute an adverse effect on the L'Enfant Plan provided the ramp and intersection are replaced in a context-sensitive manner. Removal of the E Street Expressway ramp would have a positive effect on Reservation 720 and the nearby memorial statue

of Gálvez, because it would allow for the creation of a new open, landscaped space adjacent to the reservation.

The existing connection of E Street with Virginia Avenue would be upgraded to connect with the proposed deck extending along E Street. The decked E Street between 23rd Street and Virginia Avenue might be realigned slightly, and this might necessitate taking a small portion of land on the north side of Reservation 720. This action would result in an adverse effect on the L'Enfant Plan because it would require land acquisition from Reservation 720. Potential mitigation strategies are discussed in Subchapter 4.7.2.5.

The pedestrian/bicycle improvements proposed under Alternative 4 would make the L'Enfant Plan streets in the North and Center Sectors more accessible to visitors, and enhance the plan by providing better connections to surrounding sites, including the Kennedy Center.

The L'Enfant Plan does not extend to the South Sector of the study area, so proposed improvements there would have no effect on the plan.

Georgetown Historic District and C&O Canal Historic District

The proposed improvement to the pedestrian/bicycle connection between the Rock Creek Parkway trail and the Georgetown Waterfront trail through the Thompson's Boathouse parking lot would have a beneficial effect on the two historic districts because it would provide pedestrians and bicyclists with better access to these cultural resources.

Visual Impacts

Most of the impacts of Alternative 4 on architectural resources within the APE would be visual, resulting from the construction of new structures and buildings, and the removal or concealment of existing structures.

The improvements proposed in the North Sector (described above under *Rock Creek Parkway*) have little potential to create visual impacts because they would consist mostly of removing some existing pavement and constructing new at-grade roadways. As roadways and ramps already characterize the area that would be affected by these proposed changes, they would not considerably alter its general visual character. Once construction is completed, casual observers are unlikely to notice any substantial change to the general appearance of the area.

The improvements proposed for the Center Sector would substantially and positively alter the visual character of the area. On the east side of the Kennedy Center, the Potomac Freeway would be depressed and decked over. A plaza would be constructed on the deck, with room for two symmetrically-placed, square-plan buildings, separated by a landscaped open space and a fountain. The deck supporting the plaza and building would extend along E Street to 23rd Street, creating a currently-lacking at-grade connection between the Kennedy Center, E street, and points beyond.

On the west side of the Kennedy Center, a monumental stairway would be built, linking the Center's river terrace to the waterfront and adjacent trail over the Rock Creek Parkway. The flights of stairs would be perpendicular to the river and Kennedy Center.

In the South Sector, as in the North Sector, the proposed improvements (described above under *West Potomac Park*) would not substantially alter the visual character of the area, with one partial exception: the proposed structure that would carry the Potomac Freeway over Ohio Drive. Although its height would be limited by the lowering of Ohio Drive, the structure would represent a new element in the landscape, which would be visible from afar and have the potential to interrupt existing vistas.

Only those resources with associated viewsheds that encompass either the Center or the South Sector would be affected by the proposed action. Those resources with associated viewsheds encompassing only the North Sector would not be affected, because, as noted above, the proposed changes in the North Sector would not alter the area's visual character.

The following resources would be visually affected by the proposed action in different degrees:

L'Enfant Plan of the City of Washington

In addition to the physical impacts discussed above, the proposed action would have substantial visual impacts on the L'Enfant plan, as vistas along several streets that are part of the plan would be affected. The most noticeable changes would be to the view along E Street looking west (see Subchapter 4.8, Viewshed #10); to the view along 25th Street looking south (see Subchapter 4.8, Viewshed #8); and to the view from Virginia Avenue at Juarez Circle looking southwest (see Subchapter 4.8, Viewshed #6). Generally, the new views would be of the proposed new plaza and buildings on the south and north side framing the Kennedy Center. While some of the openness of the existing viewshed would be lost, it would be replaced by more urban views of highly-designed buildings and plaza, in keeping with the visual landscape that characterizes the plan in other parts of the city. These changes in viewsheds would be the visual corollary of the partial reconstitution of the plan that would result from the improvements, as discussed under *Physical Impacts*. Provided the buildings and plaza are designed in a context-sensitive manner, they would not constitute an adverse effect.

Potomac Naval Annex Historic District; 2430 E Street Buildings; Old Naval Observatory

These three related resources are all located atop a hill between E Street and Constitution Avenue. To the west, they overlook the Kennedy Center and the roadways and traffic ramps associated with the Potomac Freeway and the E Street Expressway. Westward views from these resources would be substantially affected by the improvements proposed for the Center Sector (on the east side of the Kennedy Center). A rendering of the visual impacts on views from the Potomac Naval Annex Historic District can be found in Subchapter 4.8 (Viewsheds # 11 and 12). In general, existing short-range views over the existing roadway infrastructure would be replaced by views over the proposed plaza and the buildings to be constructed on it, while existing long-range views toward the Potomac River, Virginia, and Foggy Bottom would be entirely or partially blocked. Provided that the plaza and buildings are designed in a context-sensitive manner, the improvement of the short-range views would more than compensate for the blocking of long-range ones, so that the proposed improvements would result in no adverse effect.

The improvements proposed for the South Sector may be visible from some parts of the historic district. Provided the new bridge structure is designed in a manner sensitive to its context

(particularly the nearby Lincoln Memorial), its being visible from the Potomac Naval Annex Historic district would not constitute an adverse effect on the district.

West Potomac Park Historic District

Construction of the improvements proposed for the Center Sector would visually affect West Potomac Park and introduce new elements in existing vistas. The most visible element would be the proposed new structure that would carry the Potomac Freeway over Ohio Drive. This new structure would not constitute an adverse visual effect if it is designed and built in a context-sensitive manner. Neither would construction of the elevated portion of the proposed trail, under the same condition. The building proposed for construction on the southern side of the deck (Education Center) would also be visible from the Park. Close to the northern boundary of the Park, the edge of the deck would likely be visible as well. Visually, the new structures would define more firmly the northern boundary of the Park (see Subchapter 4.8, Viewsheds #14, 15, and 16). Provided they are designed in a context-sensitive manner, the deck and building would not have an adverse visual effect on West Potomac Park.

Lincoln Memorial and Statue of Lincoln

Because the Lincoln Memorial is located within West Potomac Park, the above discussion on the effects on the Park of the proposed changes in the Center and South Sectors generally applies to the Lincoln Memorial as well, insofar as the proposed improvements would be visible from it. It must be noted that the improvements would not be visible from the main façade and entrance to the Memorial, which faces east. They would be visible only from the north and northwest sides of the site and surrounding circle. While the top floors of the building proposed for construction on the southern side of the deck (Education Center) would be partially visible from these spots, the most noticeable visual impact would result from the proposed overpass over Ohio Drive. This impact would not constitute an adverse effect if context-sensitive design principles are employed in designing the new structure.

Arlington Memorial Bridge

The proposed improvements in the Center and South Sectors would affect the Arlington Memorial Bridge and its approaches in the same manner as they would affect the Lincoln Memorial, discussed above. Because this resource lies at a substantial distance from the proposed improvements, visual impacts would not constitute an adverse effect, particularly if the improvements are designed in a context-sensitive manner.

Northwest Rectangle Historic District and American Institute of Pharmacy

The proposed action would have partial visual impacts on these two associated resources (the Institute of Pharmacy is within the Northwest Rectangle Historic District) insofar as the proposed improvements would be visible from the western and northern edges of the district. These impacts would not constitute an adverse visual effect on the resources, provided the improvements were designed in a context-sensitive manner. On the northern side, between 23rd Street and Virginia Avenue, the proposed improvements would result in a positive impact, as the view of the below-grade E Street Expressway and exit ramp to Virginia Avenue would be replaced by a view over

decked E Street and the potential extension of Reservation 720.

Theodore Roosevelt Island

Of the improvements proposed under Alternative 4, the stairway connecting the river terrace of the Kennedy Center to the waterfront and adjacent pedestrian trail would be the most visible from the eastern shore of the island. The view from where the Roosevelt Bridge crosses the island toward the Center would also be affected (see Subchapter 4.8, Viewshed # 18). The proposed building on the southern side of the plaza – the Education Center – would block views of the Old Naval Observatory at the Potomac Naval Annex. Provided the new structures and buildings are designed in a context-sensitive manner, their construction would not result in an adverse visual effect on the vistas between the island and the Kennedy Center. The loss of some views over the Old Naval Observatory site would be mitigated by the creation of new foci of visual interest.

Foggy Bottom Historic District

Views from the southern tip of the Foggy Bottom Historic District across Juarez Circle toward the Kennedy Center would be substantially affected by the proposed action, as the existing view down the open Potomac Freeway corridor would be replaced by a more urban view defined by extended 25th Street and the building to be constructed on the northern side of the proposed plaza (Rehearsal and Office Building). The northern edge of the deck may also be visible. These visual changes would affect only a small section of the historic district, and would not constitute an adverse effect on the district, but would rather create vistas more in keeping with the urban character of the area than the existing ones.

Georgetown Historic District and C&O Canal Historic District

These two adjacent resources would be similarly affected by the proposed action. From the edges of the districts closest to the river, the proposed stairs connecting the Kennedy Center's river terrace to the waterfront and adjacent trail would be visible. This would not constitute an adverse effect on the resources, provided the stairs are designed in a context-sensitive manner.

No Impacts

Alternative 4 would have no impacts on the following resources within the APE as the resources are physically and/or visually too far removed from the sites of the proposed improvements to be affected by them in more than a negligible way:

- Sweeney Plowman Houses (Cooper Houses).
- American Red Cross DC Chapter House.

Godey's Lime Kilns, although adjacent to one of the new ramps proposed in the North Sector, would not be affected by the proposed action. This is because in the vicinity of the kilns, the new ramp would overlap with an existing roadway. Although the roadway would likely be upgraded and widened, changes to the appearance of the area would be negligible. Other proposed improvements would not be visible from the resource.

4.7.2.4 Alternative 4V

Physical Impacts

Alternative 4V would have physical impacts on three resources, as indicated below.

Rock Creek Parkway

Although Alternative 4V would differ from Alternative 4 regarding the alignment of the proposed roadways in the North Sector and the link between the Kennedy Center and the riverfront in the Center Sector, the physical impacts of Alternative 4V on Rock Creek Parkway would be similar to those of Alternative 4 for the entire study area.

West Potomac Park Historic District

For Alternative 4V, the physical impacts on the West Potomac Park Historic District would be less pronounced than under Alternative 4, as no grade separation is proposed for the intersection of Potomac Freeway and Ohio Drive under this alternative. Instead, the intersection would be realigned and signalized. The proposed improvements would not cause functional changes, as they would only modify and improve existing intersections and roadway connections. Roadways and traffic ramps functionally and visually dominate the section of the park affected by the Alternative 4V improvements. Other improvements proposed under Alternative 4V in the South Sector are the same as those proposed under Alternative 4. The proposed improvements would not constitute an adverse effect on the park.

L'Enfant Plan of the City of Washington

Alternative 4V would have physical impacts on the L'Enfant Plan similar to those described for Alternative 4. There would be some differences relating to the proposed deck and E Street Expressway connections, as discussed in the following paragraphs. All other impacts (including the creation of a new reservation) would be the same as those described for Alternative 4. The proposed improvements would not constitute an adverse effect on the L'Enfant Plan.

In the Center Sector, Alternative 4V would substantially and directly affect the L'Enfant Plan through the proposed construction of a deck over the Potomac Freeway connecting the Kennedy Center to the street grid to the north and east. The deck would be smaller than that proposed under Alternative 4, not extending as far south and north. It would be designed to accommodate the buildings conceived by architect Rafael Viñoly for the Kennedy Center. These buildings would be in triangular/trapezoidal-shaped lots similar in spirit to the small triangular reservations located within the L'Enfant Plan grid, and would not be aligned with the street grid, unlike the buildings assumed under Alternative 4.

Although 25th Street would be extended to link the plaza to the street grid to the north, as under Alternative 4, Viñoly's concept would also require that extended 25th Street remain close to its existing alignment, curving west south of F Street and running along the east façade of the Kennedy Center. An internal circulation roadway would be built around a new open space that would be curvilinear and centered around a water feature that would extend up the plaza eastward along E

Street to 23rd Street, creating a median for the E Street surface road. The internal circulation road would have connections to 25th Street, the new surface E Street, the Kennedy Center, and the entry points to the existing garages.

East of 23rd Street, Alternative 4V would eliminate the ramp connecting the eastbound E Street Expressway off-ramp to Virginia Avenue along the northern edge of the State Department with E Street westbound. This ramp diverges from the main ramp (which would be maintained) where the main ramp merges with D Street. The L'Enfant Plan at this location has little integrity, and removal of this small ramp would not constitute an adverse effect on the Plan provided the ramp is replaced in a context-sensitive manner.

As under Alternative 4, there would be a potential adverse effect on Reservation 720 due to the realignment of the intersection between E Street and Virginia Avenue. This action would result in an adverse effect on the L'Enfant Plan, as it would require land acquisition from Reservation 720. Potential mitigation strategies are discussed in Subchapter 4.7.2.5.

Georgetown Historic District and C&O Canal Historic District

Impacts would be similar as those described under Alternative 4V, and would not constitute an adverse effect.

Visual Impacts

In general, the differences between the improvements proposed under Alternative 4V and those proposed under Alternative 4 are not of such a nature that they would lead to different conclusions from those reached in the impact analysis for Alternative 4. One partial exception would be that Alternative 4V, unlike Alternative 4, would have visual impacts on Godey's Lime Kilns, but, as described below, these impacts would not constitute an adverse effect on the kilns. Provided improvements are made in a context-sensitive manner, there would be no adverse visual effects on any of the architectural resources located within the APE.

Godey's Lime Kilns

The lime kilns are currently situated near two access ramps to the Whitehurst Freeway. The construction of the proposed new connection between the Rock Creek Parkway and the Potomac Freeway would result in the substantial widening of the existing at-grade ramp near the kilns. This improvement may further compromise the resource's setting. Adverse effects could be avoided only by designing the roadwork in a context-sensitive manner, which might include appropriate landscaping and plantings to screen the kilns from the widened roadway.

L'Enfant Plan of the City of Washington

Most visual impacts are the same as those described for Alternative 4, and there would be no adverse effect on the L'Enfant Plan. However, the shape and size of the proposed deck and buildings would differ noticeably from what is proposed under Alternative 4. The buildings conceived by architect Viñoly are not symmetrical and not integrated within the historic street grid. Therefore, they would provide the type of vista traditionally associated with the L'Enfant Plan.

However, because they would be highly-designed structures, they would create new positive foci of visual interest where none presently exist, and to that extent represent a visual enhancement of the Plan in the area of the Kennedy Center.

Potomac Naval Annex Historic District; 2430 E Street Buildings; Old Naval Observatory

The visual impacts of Alternative 4V would be similar to those of Alternative 4, except that Alternative 4V would not build an above-grade bridge in the South Sector, thus resulting in no potential vertical visual impacts.

West Potomac Park Historic District

The visual impacts of Alternative 4V would be similar to those of Alternative 4, except that Alternative 4V would not have an above-grade bridge in the South Sector, thus resulting in no vertical visual impacts.

Lincoln Memorial and Statue of Lincoln

The visual impacts of Alternative 4V would be similar to those of Alternative 4, except that Alternative 4V would not have an above-grade bridge in the South Sector, thus resulting in no vertical visual impacts.

Arlington Memorial Bridge

The visual impacts of Alternative 4V would be similar to those of Alternative 4.

Northwest Rectangle Historic District and American Institute of Pharmacy

The visual impacts of Alternative 4V would be similar to those of Alternative 4.

Theodore Roosevelt Island

The visual impacts of Alternative 4V would be the same as those of Alternative 4.

Foggy Bottom Historic District

The visual impacts of Alternative 4V would be similar to those of Alternative 4.

Georgetown Historic District and C&O Canal Historic District

The visual impacts of Alternative 4V would be similar to those of Alternative 4.

No Impacts

Alternative 4V would have no impacts on the following resources within the APE because there resources are physically and/or visually too far removed from the sites of the proposed improvements to be affected by them in more than a negligible way:

- Sweeney Plowman Houses (Cooper Houses).
- American Red Cross DC Chapter House.

4.7.2.5 Mitigation Measures

Implementation of Alternatives 4 or 4V would result in an adverse effect on the L'Enfant Plan because it would require acquisition of land from Reservation 720 that currently includes the Gálvez statue, although the statue itself would remain intact and not be affected by the alternatives. Potential mitigation strategies include redesign of the proposed roadway improvements to avoid this strip of the reservation. If acquisition cannot be circumvented, efforts should be made to design the roads in a manner that is sensitive to the reservation context. Methods to mitigate adverse effects would be included in a Memorandum of Agreement initiated by FHWA, the lead agency for the KCAI project.

Neither Alternative 4 nor 4V would result in adverse effects on the resources in the APE, provided that context-sensitive design principles are employed in designing and constructing the roadway improvements and the Kennedy Center Plaza and its associated features.

4.8 Aesthetics and Viewsheds

4.8.1 No Action Alternative

The No Action Alternative would not result in any alteration to the aesthetic and visual characteristics of the study area. Existing viewsheds, as described in Subchapter 3.8.4, would remain unchanged. The No Action Alternative would have no negative impacts on aesthetics and viewsheds.

4.8.2 Alternative 4

Implementation of Alternative 4 would have a substantial positive effect on the visual character of the study area, particularly immediately east of the Kennedy Center, where construction of the proposed plaza over the Potomac Freeway and the E Street Expressway would create an entirely new cityscape.

The plaza proposed under Alternative 4 would be rectangular in form, with two symmetrical, rectilinear buildings at its southern and northern ends, respectively, framing the Kennedy Center. An idea of what the plaza could look like is provided by the renderings shown in Figure 1-4 in Appendix A.

Overall, the new E Street and Plaza would provide a new, monumental approach to the Kennedy Center, in keeping with the Center's architectural distinction and status as a presidential memorial and national showcase for the performing arts. It would represent a distinct improvement on the current setting, dominated by the Potomac Freeway, E Street Expressway, and associated ramps.

In addition to the plaza, Alternative 4 would build a monumental set of stairs on the west side of the Kennedy Center, connecting the Center's west terrace to the riverfront, proposed boat dock, and adjacent pedestrian trail. Although no specific design has yet been developed for the stairs, for the purpose of this impact analysis, it is assumed that they would run perpendicular to the river and terrace, and include elevator shaft for handicapped access. The stairs would be designed in a manner sensitive to their context, in a style compatible with the Kennedy Center's.

Finally, a third element of Alternative 4 would affect aesthetically the study area: the construction of a bridge carrying the southbound Potomac Freeway over Ohio Drive in West Potomac Park. To limit potential visual impacts, Ohio Drive would be lowered by about 10 feet at the intersection, allowing the new structure not to exceed approximately 10 feet in height. The new structure would be designed in a context-sensitive manner.

The plaza, stairs, and proposed buildings are the elements with the most potential to affect visual corridors and vistas in the study area. To assess their impacts on the 18 viewsheds described in Subchapter 3.8.4, renderings integrating the mass and general layout of the proposed plaza and buildings, and stairs into the landscape were produced and are shown in the following pages, along with a discussion of impacts on each viewshed.

It must be noted that these renderings are limited by virtue of their static nature. The change in visual character resulting from the proposed work would be perceived in three dimensions and from moving vantage points. It is difficult to render and assess each of these changes. Additionally, at this early stage in the project, no information is available on any specific design elements. However, even in these conditions, it can be concluded that the proposed improvements would considerably enhance the aesthetic and visual quality of the study area by providing a new monumental approach to the Kennedy Center and new points of visual interests from a variety of vantage points throughout the study area.

While some existing views would be blocked, creating minor to major negative impacts, they would be replaced by views over the new plaza and buildings that would provide the area with a new, better defined, and more attractive visual identity, resulting in no significant negative impacts on aesthetics and viewsheds. The impacts of Alternative 4 on the aesthetic character of the study area would overall be fully positive.

4.8.3 Alternative 4V

From the point of view of visual and aesthetic impacts, Alternative 4V differs from Alternative 4 mainly because it integrates the major elements of the design concept proposed for the plaza and new buildings by architect Rafael Viñoly. An idea of this concept can be obtained from the renderings shown in Appendix A, Figures 2-2 and 2-3. Although these renderings represent the earliest stages of project design, it is evident that the Kennedy Center has chosen an architect

capable of creating a major enhancement to the environment and urban fabric of the city. In Viñoly's concept, the plaza would be smaller, and the buildings less rectilinear than those assumed under Alternative 4. While the Alternative 4 plaza and buildings would be visually aligned with the historic street grid, the Alternative 4V plaza and buildings would visually frame and enclose the Center in a manner that would set it off more clearly from the surrounding city. However, a strong visual link would be created with the street grid through a cascading fountain along E Street.

On the west side of the Center, Alternative 4V would provide a link with the riverfront, proposed boat dock, and adjacent trail. For the purpose of the present evaluation, the link has been assumed to consist of two flights of stairs parallel to the river and the Center, with a curved connection to the Center's west terrace. Elevator shaft would be added for handicapped access.

Under Alternative 4V, no new structure would be built in West Potomac Park, as the intersection of Ohio Drive with the Potomac Freeway would be realigned but remain at grade.

The impacts of Alternative 4V in the 18 viewsheds described in Subchapter 3.8.4 are assessed in the following pages, along with those of Alternative 4. As under Alternative 4, while some existing views would be blocked, creating minor to major negative impacts, they would be replaced by views over the new plaza and buildings that would provide the area with a new, better defined, and more attractive visual identity, resulting in no significant negative impacts on aesthetics and viewsheds. The impacts of Alternative 4V on the aesthetic character of the study area would overall be fully positive.

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4.9 Socioeconomics and Community Facilities

4.9.1 Demographics

4.9.1.1 No Action Alternative

There would be no change to the existing community under the No Action Alternative. Therefore, the No Action Alternative would have no impacts on existing demographic conditions.

4.9.1.2 Alternative 4

Alternative 4 would not displace residents or induce residential growth within the study area. Therefore, Alternative 4 would have no impacts on existing demographic conditions.

4.9.1.3 Alternative 4V

Alternative 4V would not displace residents or induce residential growth within the study area. Therefore, Alternative 4V would have no impacts on existing demographic conditions.

4.9.2 Employment, Earnings, and Expenditures

4.9.2.1 No Action Alternative

Subchapter 3.9 describes existing economic conditions within the study area. Under the No Action Alternative, conditions would remain essentially unchanged.

4.9.2.2 Alternative 4

Employment and Income Impacts

Alternative 4 would have an indirect, positive impact on local permanent employment due to the staffing of the proposed new buildings on the plaza. The addition of new staff, performers, and visitors to the Kennedy Center would inject new earnings and expenditures into the economy, which would indirectly generate new employment and earnings in the District and in the region. Based on the size and function of the proposed buildings, a net increase of 300 staff and performer jobs is assumed for this analysis.

In the context of the Washington, DC labor force, a net increase of 300 staff and performer jobs would represent 0.12 percent of the November 2002 employed resident labor force of the District (251,800), or 0.05 percent of the total wage and salary employment (655,800). At these proportions, the anticipated employment would be a relatively minor increase and would be unlikely to create problems for the local labor force to absorb. It would, however, represent a modest positive improvement in employment opportunities in the District.

As noted in Subchapter 3.9, total wages and salaries paid by the Kennedy Center in FY 2001

amounted to \$40,717,751. Total staff (full- and part-time) was 1,245, which implies a mean annual wage of \$32,705. While there is no clear indication of exactly who (what categories) would be included among the new staff and performers at this time, if the current average is applied, it would imply that the 300 new staff and performers would receive average salaries of \$33,880 (in 2003 dollars) or an approximate total of \$10.2 million (in 2003 dollars).

Additionally, the improvements to the Kennedy Center under this alternative are expected to increase the number of tour visitors by 200,000 (up from one million), and the number of student visitors by 40,000 (up from 200,000). In contrast to these 20 percent increases, the number of performance visitors is projected to remain unchanged at roughly one million, given that there are no proposed changes to the primary performance venues in the Center.

The market analysis for the Kennedy Center, conducted by Economics Research Associates (ERA) in 1999 (FHWA, September 2000) estimated that tour visitors spend an average of \$18 per visit -- \$10 on meals and \$8 on retail. The ERA market analysis makes no distinction for visiting students, but the conservative assumption is made that there would be minimal sales to students, resulting in the omission of this potential expenditure. Therefore, inflating the \$18 per visitor in 1999 to \$19.86 in 2003 and assuming an increase of 200,000 visitors, there would be an increase of about \$4 million in associated sales generated at the Center and in the immediate area. Thus, the combined increase in direct salaries and visitor expenditures associated with the proposed action is estimated to be roughly \$14 million per year (in 2003 dollars).

The direct permanent employment and spending by the increased number of visitors would generate additional secondary economic activity, as new expenditures circulate in the local and regional economies. Estimates of these secondary jobs and earnings have been derived from RIMS II, an econometric input/output model created by the US Bureau of Economic Analysis (BEA) (BEA, 2003). Categories of employment are allocated to their respective standard industrial classifications in the input/output matrix, which is then used to obtain the direct-effect multipliers. A particular feature of the District economy, however, is the degree to which the secondary economic effects disperse to the broader region. This effect is known as “leakage” and, in the case of the District, alters the scale of these secondary economic impacts substantially (especially for the construction expenditures, discussed in Subchapter 4.14). Consequently, the model’s results for the District are compared to those for the wider region of Northern Virginia (Arlington, Loudoun, Stafford, Fairfax, and Prince William counties) as a surrogate indicator for the larger economic effects of the proposed action. The employment impacts (direct and indirect) of the permanent jobs and visitors’ expenditures are shown in Table 4.9-1, for both the District and regional versions of the model.

Table 4.9-1
Projected Employment - Alternative 4 (2003\$)

Activity	Direct Wages / Expenditures (\$)	Direct Employment	Indirect Employment	Total Employment
DC RIMS II Model				
Theater	10,203,960	300	148	448
Eating & Drinking	2,222,222	0	20	20
Retail	1,777,777	0	15	15
Total	14,203,959	300	183	483
Regional (Northern Virginia) RIMS II Model				
Theater	10,203,960	300	182	483
Eating & Drinking	2,222,222	0	69	69
Retail	1,777,777	0	55	55
Total	14,203,959	300	306	607
Source: US Dept. of Commerce, Bureau of Economic Analysis, RIMS II Input/Output models, 2003.				

The largest category of direct permanent inputs to the model is anticipated new employment. These earnings are assigned to the Theater (Theatrical Producers, Industry Code 76.021) in the model. The expenditures from the new tour visitors are assigned to “Eating and Drinking” and “Retail.” The total employment generated by the estimated employment for Alternative 4 is computed, and indirect effects are obtained by deducting the direct employment. Using the RIMS II model, total direct and indirect employment for the District is computed to be 483 jobs, with indirect employment representing about 38 percent of this (183 jobs). Using the regional model, total direct and indirect employment is computed to be 606 jobs, with indirect employment representing 50.5 percent of this (306 jobs).

With respect to earnings generated by Alternative 4, the RIMS II model for the District projects total earnings to be about \$23.7 million, of which roughly \$9.5 million, or 40 percent, would be generated indirectly. Alternatively, using the regional model, total earnings are projected to be \$25.5 million, of which \$11.3 million, or 44 percent, would be generated indirectly (Table 4.9-2).

Thus, total indirect employment as a result of the direct permanent Kennedy Center employment and anticipated expenditures of the new increment of tour visitors is seen to range from 183 jobs for the District to 306 jobs for the region. Indirect earnings range from \$9.5 million in the District to \$11.3 million in the region.

Table 4.9-2
Projected Earnings- Alternative 4 (2003\$)

Activity	Direct Earnings / Expenditures (\$)	Indirect Earnings	Total Earnings
DC RIMS II Model			
Theater	10,203,960	8,577,449	18,781,409
Eating & Drinking	2,222,222	422,000	2,644,222
Retail	1,777,777	465,600	2,243,377
Total	14,203,959	9,465,049	23,669,008
Regional (Northern Virginia) RIMS II Model			
Theater	10,203,960	9,218,257	19,422,217
Eating & Drinking	2,222,222	1,210,889	3,433,111
Retail	1,777,777	882,666	2,660,443
Total	14,203,959	11,311,813	25,515,772
Source: US Dept. of Commerce, Bureau of Economic Analysis, RIMS II Input/Output models, 2003.			

Fiscal Impacts

Improvements at the Kennedy Center would generate some modest fiscal benefits from the expansion of facilities and access. Alternative 4 is estimated to generate 300 new direct staff and performer jobs at the Center. These new jobs, along with employment from the secondary economic effects of household expenditures, visitors' expenditures, and jobs from the temporary construction phase would generate new revenues from taxes and fees.

No new property taxes are anticipated from the project because of the Kennedy Center's exempt public status. However, the District would benefit from new income taxes on the workers at the Kennedy Center, from new sales taxes, and from various other taxes and fees. Accurate and detailed estimates of these taxes are very difficult to calculate and only order-of-magnitude estimates are possible. Applying the District income tax schedule – 7.0% for individuals in the \$30,000 to \$40,000 income bracket – to the projected employment and earnings, and assuming that 28 percent of all employees are District residents (as reflected by the 2000 census), the model generates annual totals of roughly \$200,000 from the direct permanent employees and an additional \$222,000 from indirect employment using the regional RIMS II model and the same assumptions. Temporary construction employment (see also Subchapter 4.14) would provide additional income taxes; applying similar assumptions to those used for the permanent employees and using the high estimate of construction costs (assuming that 33 percent of the total construction employment occurs in each of three years), results in an estimate of \$1.086 million a year in new income taxes from direct and indirect construction employment (see Table 4.9-3).

Sales taxes are another important source of potential revenue for the District. Although the District imposes various sales tax rates for retail, liquor, restaurants, parking, and hotel expenditures, for the purposes of this EA, the retail rate of 5.75 percent is applied to 25 percent of new District-residing workers' incomes and to 10 percent of the income of the new workers who are assumed to reside elsewhere. In addition, sales taxes would be collected from the \$4 million in visitor expenditures. The total permanent sales taxes generated for the District would be \$408,000 per year. Sales taxes generated by temporary construction employment and the indirect employment this creates would also contribute to new revenues. Applying similar assumptions to those defined above generates a total of \$967,000 per year for an assumed build period of three years.

Table 4.9-3
Alternative 4: Annual Projected New Tax Revenues (\$1,000s in 2003\$)

Category	Income Taxes	Sales Taxes	Other Taxes and Fees ¹	Total Tax Revenues
Permanent				
Permanent Direct Employees	200	86	43	329
Permanent Indirect Employees ²	222	92	47	361
Visitor Expenditures	n/a	230	35	265
Subtotal	422	408	125	955
Temporary³				
Temporary Direct Employees	579	503	162	1,244
Temporary Indirect Employees	507	464	146	1,117
Subtotal	1,086	967	308	2,361
Notes: ¹ Assumes all other taxes would represent an additional 15% to income and sales taxes. ² Data derived from the RIMS II model for Northern Virginia for indirect employees. ³ Uses the high construction cost estimate and annualizes the data over three years.				

Business franchise taxes in the District are another important type of income tax, levied at a nine percent rate in FY2003. Such taxes would apply only to indirect and temporary employment and to businesses within the District. Given the complexities of estimating this tax on corporations and unincorporated businesses and the problems in differentiating between public and private employment within and outside the District, these are not estimated here.

Additional District revenues would accrue from a variety of other small taxes and fees, including gross receipts taxes on utilities, mortgage recording taxes, and insurance premiums. Together, these taxes and fees represented 18 percent of District-generated revenues in FY2002. For the purpose of this EA, all these other taxes and revenues are estimated to add 15 percent to the projected revenues generated under the principal tax sources of income and sales taxes estimated here.

Table 4.9-3 shows anticipated income and sales tax revenues from both permanent operations and temporary activity associated with the construction phase. The District can anticipate total annual revenues of roughly \$955,000 (in 2003\$) from permanent operations under Alternative 4. In addition, short-term revenues of over \$2.3 million are projected over each year of a three-year construction period. Additional substantial tax revenues would be collected in the surrounding metropolitan region from direct and indirect employees and businesses that would benefit from the proposed project, but no effort is made to define these revenues because of the inherent complexity of identifying the relevant taxing jurisdictions.

4.9.2.3 Alternative 4V

There are no anticipated differences in the way the Alternative 4 and Alternative 4V would affect the projected increase in tour visitors, student visitors, or new staff and performers. Thus, their economic and fiscal impacts would be the same.

4.9.3 Community Facilities

4.9.3.1 No Action Alternative

The No Action Alternative would have no effect on community facilities in the study area. The No Action Alternative would result in continuation of the current levels of delay in response times for fire, EMS, and police services caused by traffic congestion.

4.9.3.2 Alternative 4

Alternative 4 would have minor effects on community facilities in the study area. Minor construction-related impacts are possible (see Subchapter 4.14). Upon completion of the proposed action, Alternative 4 is likely to have a minor positive effect on emergency services by improving traffic conditions.

4.9.3.3 Alternative 4V

The effects of Alternative 4V on community facilities would be the same as for Alternative 4.

4.10 Kennedy Center Operations and Management

4.10.1 No Action Alternative

Under the No Action Alternative, conditions would remain essentially unchanged. Consequently, the overcrowded conditions for the Center's staff and performers would persist, and the needs for additional parking, especially bus and truck parking and unloading, would go unmet and would continue to constrain the operations and public benefits that the Center provides. These conditions would hinder the Kennedy Center management's goal of maintaining and expanding visitation to the

Center, especially during the day, when facilities are not fully utilized.

4.10.2 Alternative 4

In the long term, Alternative 4 would provide important improvements to the contextual ambiance of the Center, generating an enhanced sense of place and overcoming several operational constraints. Among the many improvements is the provision of a deck over the Potomac Freeway and several connecting roadways. The deck would enable a dramatic change to the face of the Center by providing for a plaza in front of its eastern facade, creating a more suitable and ceremonial gateway to the nation's center of the arts, as well as possibly providing for occasional outdoor performances or simulcast screenings of sold-out performances. The deck would also provide much greater accessibility to the Center for pedestrians and bicyclists and for those coming from the National Mall and Downtown. Improvements to the access roadways and provision of additional parking (estimated at 350 spaces per level under the deck, with a possibility of two levels of parking) would help reduce congestion and provide additional security.

Two buildings, totaling about 285,000 square feet, are proposed for the new plaza. These are to be financed with private funds raised by the Center. The two new buildings would not only frame the entrance to the Center in a complementary design and arrangement, but are expected to become intrinsic components of the Center and dynamic institutions in their own rights. One building (the north building) would provide rehearsal and administrative space for the Kennedy Center and the Washington Opera. The new rehearsal space would also provide opportunities for the public to watch professional artists at work by viewing black-box-work-in-progress previews and small Millennium Stage-type intimate performances for audiences of up to 300 visitors. The second building (south building) is proposed to house education programs. This education center would be a new venue for visitors to experience the arts, including possibly an exhibition on the history of the performing arts, featuring collections from the Library of Congress and the Smithsonian Institution. State-of-the-art technology is intended to enable visitors to participate in the arts in new ways, to include conducting a virtual orchestra; designing sets and costumes for a ballet; playing with lighting and sound effects on a special stage; and designing their own theater season. Such additions are expected to make the expanded Kennedy Center the most exciting and sophisticated arts campus in the world (M. Kaiser, May 20, 2003).

The Kennedy Center presently offers one of the most extensive arts education programs, reaching over 11 million people with innovative programs, including the DC Public Schools Partnership; the Dance Theatre of Harlem Residency; Imagination Celebration; Performance Plus; Professional Development Opportunities for Teachers; distance-learning initiatives; the Partners in Education program, which mentors relationships between arts organizations and community school systems; the training of young artists through the Center's Conducting Institute, National Music Institute, and American College Theater Festival; and two new programs, the Vilar Institute for Arts Management and the Capacity Building Program for Culturally Specific Arts Organizations. These educational activities would be the primary beneficiaries of facilities provided by the new education center.

The existing Center lacks direct access to the Potomac River. Alternative 4 would provide the Center with a stairway over the Rock Creek Parkway and directly connect it to the waterfront. Although part of the original concept for the Center, this waterfront connection was never built. Its

inclusion would not only provide access to pedestrians and bicyclists, who have an existing path along the river, but would also provide for a floating dock for potential taxi-water service, all of which would substantially improve access to Center from one of its most dramatic perspectives.

In the long term, Alternative 4 would substantially improve the physical conditions for the Center's operations. The intense overcrowding of the existing Center and its lack of convenient access would be alleviated. These improvements would permit the Center to provide expanded programming and more effective and efficient administration of its programs, all within a much-enhanced design setting that would link the Center more firmly to the National Mall and its surrounding neighborhoods.

In the short term, Kennedy Center operations would be affected negatively by construction activities that would cause access roads to be rerouted and create noise and dust. These impacts are described by construction stage in Subchapter 4.14.

4.10.3 Alternative 4V

Alternative 4V is expected to have the same impacts on Kennedy Center operations and management as Alternative 4V.

4.11 Urban Systems

4.11.1 No Action Alternative

The No Action Alternative would not have any impacts on urban systems in the study area.

4.11.2 Alternative 4

4.11.2.1 Sewerage

Alternative 4 would not affect either of the study area's two pumping stations or the dual, stacked sewers near the Kennedy Center. The new parking garage would be constructed to avoid the dual, stacked sewers, and the new garage would have an entry point separate from the existing garage. Although patrons would be able to walk between the garages, vehicles would not be able to drive between them.

In the North Sector the new connections between the Potomac Freeway and the Rock Creek Parkway most likely would not impact the 7-foot by 7-foot steam tunnel, the 3-foot combined sewer under K Street, the 14-foot-6-inch by 11-foot-7-inch East Side Rock Creek Diversion Sewer, or the other 6-foot combined sewer that enters the study area near the Rock Creek Sewage Pumping Station. Specifically, any potential impact to these sewers and the steam tunnel would result from the construction of the proposed ramp from the northbound Potomac Freeway to the northbound

Rock Creek Parkway. It is unlikely that the 96-inch storm sewer and 54-inch sanitary separate sewer beneath I Street would be affected by the creation of the ramp from 27th Street to the southbound Potomac Freeway, as the ramp would be close to existing grade. Depending on the current depth of the sewers and the proposed grade of the new ramps, the sewers and steam tunnel may have to be relocated. Additional investigation and data collection are required to verify the depth of the conduits prior to construction.

In the Center and South Sectors, the lowering of the Potomac Freeway and Ohio Drive would impact five major sewers. The 6-foot-6-inch combined sewer that passes beneath the Potomac Freeway in the Center Sector would have to be relocated. The other large 13-foot by 7-foot combined sewer that passes beneath the Potomac Freeway in the South Sector may have to be lowered; however, this is unlikely because the Potomac Freeway would be close to existing grade at that location. Finally, the lowering of Ohio Drive would affect the 11-foot-3-inch by 11-foot-3-inch combined sewer beneath Constitution Avenue that extends to the Potomac River and the two large sewers – the 96-inch separate sanitary sewer and the 72-inch combined sewer – that transport sewage from the Potomac Sewer Pumping Station to the Blue Plains Treatment Plant. These three sewers would have to be relocated to accommodate the lowering of Ohio Drive and the on/off ramps of Ohio Drive and the Potomac Freeway.

The future construction of the two new buildings on the plaza may require small additional sewers to transport wastewater and sewage from the new buildings to the existing sewers that currently serve the Kennedy Center. Such minor additions would not considerably affect the current sewer system.

4.11.2.2 Potable Water

Alternative 4 would have no major negative impacts on potable water supply. Alternative 4 has a slight potential to impact the 24-inch water main beneath K Street in the North Sector. The impact on the water main in the North Sector depends on the current depth of the pipe and on the proposed grade for the new ramp carrying northbound traffic from the Potomac Freeway to the northbound Rock Creek Parkway. However, it is likely that the water main is at a depth that would be impacted, given that the northbound Potomac Freeway currently passes under K Street below grade.

The construction of the two new buildings on the plaza may require small connecting lines to transport potable water to the new buildings from the existing water lines. The buildings would not be tall enough to require an upgrade from low to first high service; any additional water line would be categorized as low service. Such minor additions would not considerably affect the capacity of the current water distribution system.

4.11.2.3 Electricity

Alternative 4 would not have any major negative impacts on the electrical system in the study area. Only the underground power line running from Constitution Avenue to the Potomac Sewer Pumping Station would be affected due to the lowering of the Potomac Freeway. This line could either be lowered below the proposed grade for the freeway or diverted to an aboveground line in the affected section.

The electrical transformers, duct banks, and utility rooms adjacent to the existing parking garage cannot be moved. Therefore, it would be difficult to design the new parking garage, as proposed in Alternative 4, to connect internally to the existing parking garage (a pedestrian-only connection may be possible). The two garages would have to maintain separate vehicular entry points to avoid moving the existing utility corridor.

The proposed stairway, boat dock, plaza, plaza buildings, parking garage, roadway lighting, and new traffic signals would all require small additional lines to supply power. The new electrical lines could be connected simply to the existing lines that currently service the Kennedy Center and Rock Creek Parkway. Such minor additions would not appreciably affect the study area's power supply.

4.11.2.4 Gas Lines

Alternative 4 would impact gas lines that pass beneath the Potomac Freeway. The lowering of the freeway would require disconnection of the gas lines and construction of new lines, either at a greater depth below the proposed grade for the Potomac Freeway or along a new route.

It is unlikely that Alternative 4 would increase the demand or requirements for gas supply. Should the two new buildings require gas service, new connections could easily branch from the gas lines that currently serve the Kennedy Center. Such minor additions would not appreciably affect the capacity of the current gas lines in the study area.

4.11.2.5 Telephone Lines

It is unlikely that Alternative 4 would impact any major telephone lines in the study area. However, it is probable that new lines would need to be installed to service the two proposed buildings on the plaza.

4.11.2.6 Mitigation Measures

The most probable mitigation measures associated with Alternative 4 would be to relocate existing utility lines that would be affected by lowered roadways and to create new utility service connections for new site features. Any necessary mitigation measures would be coordinated with appropriate authorities: District of Columbia Water and Sewer Authority (DCWASA), Potomac Electric Power Company (PEPCO), Washington Gas and Light Company, and Verizon.

4.11.3 Alternative 4V

4.11.3.1 Sewerage

The impacts of Alternative 4V on the sewer system would be similar to those of Alternative 4. However, in the South Sector, the connection of Rock Creek Parkway and Ohio Drive would remain at or near existing grade so the three sewers (two combined and one separate sanitary) that run beneath that ramp would not be affected. As described for Alternative 4 in Subchapter 4.11.2.1, the lowering of the Potomac Freeway would impact one large combined sewer and possibly another

large combined sewer. In the North Sector, Alternative 4V has one potential impact; the ramp connecting the Rock Creek Parkway to the southbound Potomac Freeway is proposed to be a depressed roadway and may require relocating the 36-inch storm sewer and 24-inch water line beneath K Street and the 96-inch and 54-inch sewers beneath I Street. Alternative 4V would also require additional connections (similar to those described for Alternative 4) for disposal of wastewater and sewage from the proposed buildings on the plaza.

4.11.3.2 Potable Water

Although there are different ramp designs in the North Sector, the impacts of Alternative 4V on the potable water system would be the same as those of Alternative 4.

4.11.3.3 Electricity

The impacts of Alternative 4V on the electrical system would be the same as those of Alternative 4.

4.11.3.4 Gas Lines

The impacts of Alternative 4V on the gas lines would be the same as those of Alternative 4.

4.11.3.5 Telephone Lines

The impacts of Alternative 4V on telephone lines would be the same as those of Alternative 4.

4.11.3.6 Mitigation Measures

Mitigation measures for Alternative 4V would be similar to those described for Alternative 4.

4.12 Natural Resources

4.12.1 Topography, Geology, and Soils

4.12.1.1 No Action Alternative

Implementation of the No Action Alternative would not change existing topography, geology, or soils within the study area.

4.12.1.2 Alternative 4

Appendix A Figure 4.12-1 (Alternative 4 Impacts on Floodplains) shows the roadway changes that would occur under Alternative 4. Implementation of Alternative 4 would require the removal of approximately 43,000 square yards (9 acres) of existing pavement, 125,800 cubic yards of rock (largely gneiss bedrock), and 251,600 cubic yards of soils (largely Udorthents or Urban Fill) within the study area. Construction of new roads and parking areas would require approximately 53,700

square yards (about 11 acres) of new pavement, for a net increase of 10,700 square yards (about 2 acres) of impervious paved surfaces when construction is completed.

The Udorthents and Urban Land soils present at the project area can present limitations for construction activities. Most areas of Udorthent soils are subject to subsidence and, without proper construction measures, have poor potential for use as building sites. Urban Land often consists of fill that has been placed over streams, swamps, floodplains, and tidal marshes. During the design phase, a full geologic and geotechnical investigation would be performed to help identify what kind of foundations and other measures would be needed for the proposed construction.

Implementation of this alternative would result in numerous small changes in topography, varying from one to 20 feet in elevation. The most extensive changes would occur with the lowering of the Potomac Freeway as it passes beneath the proposed deck plaza on the eastern side of the Kennedy Center. The Potomac Freeway would be lowered from about Elevation 15 to Elevation -5, project datum. The section of Ohio Drive would be lowered from about Elevation 15 to Elevation -2, project datum. The lowered grades would create a basin with the potential to collect and pond surface runoff from surrounding areas (Subchapter 4.12.2). The need for water removal measures would be evaluated as part of the design process, and appropriate measures would be implemented.

Construction activity would affect an approximately 72-acre area over the period of construction. Areas not directly affected by construction of the new deck and roadways or removal of the old roadways would be affected by the movement of construction-related vehicles, temporary staging areas, placement of erosion and sedimentation control measures, etc. Construction of the floating dock and wharf would require installation of pilings, which would cause disturbance and resuspension of the Potomac River bottom sediments in the vicinity of the proposed dock. These impacts would be temporary and minor.

4.12.1.3 Alternative 4V

Appendix A Figure 4.12-2 (Alternative 4V Impacts on Floodplains) shows the roadway changes that would occur under Alternative 4V. Implementation of Alternative 4V would require the removal of 31,900 square yards (6.59 acres) of existing pavement, 126,570 cubic yards of rock (largely gneiss bedrock), and 253,140 cubic yards of soils (largely Udorthents or Urban Fill) within the study area. Construction of new roads and parking areas would require approximately 81,660 square yards (16.87 acres) of new pavement, for a net increase of 49,760 square yards (10.28 acres) of hard surface. Alternative 4V creates more hard surface than Alternative 4 because the area of new roadway in the North and South Sectors is greater than under Alternative 4.

As for Alternative 4, Udorthents and Urban Land soils at the project area could present limitations for construction activities, requiring a detailed onsite geologic and geotechnical investigation to identify design requirements if Alternative 4V is selected.

Implementation of this alternative would also result in numerous small changes in topography, varying from one to 20 feet. As in the case of Alternative 4, the most extensive changes would occur with the lowering of the Potomac Freeway, which would be depressed below the proposed deck, as in Alternative 4. Any appropriate water removal measures needed would be part of the design.

This alternative also includes construction of a wharf and floating dock and installation of pilings, with minor temporary disturbance and resuspension of the Potomac River bottom sediments in the vicinity of the proposed dock.

4.12.1.4 Mitigation Measures

Regardless of which alternative is implemented, the FHWA would require the construction contractor to use appropriate erosion and sedimentation control measures during construction. An erosion and sedimentation control plan is required as part of the site plan approval process, and would be reviewed and approved by the DC Watershed Protection Office (Department of Health).

4.12.2 Hydrology/Water Resources

4.12.2.1 No Action Alternative

Implementation of the No Action Alternative would not impact waterways, floodplains, or wetlands.

4.12.2.2 Alternative 4

Waterways

The proposed design under this alternative would augment the Rock Creek Parkway Trail along the shoreline of the Potomac River but above the ordinary high water line and therefore not within the river itself. The design also includes a pedestrian connection from the Kennedy Center River Terrace to the riverfront, descending from the western edge of the plaza deck to a proposed wharf parallel to the shoreline and existing granite revetment wall, from which a T-section floating dock would extend into the river. The wharf would be pile-supported, and the dock would be a floating dock attached to pilings at its waterward edge.

The wharf would project up to 30 feet into the Potomac River and extend approximately 300 feet along the shoreline. The 90-foot-long floating dock would project an additional 30 feet into the river. These structures would obstruct navigation servitude in this part of the shoreline, but to a very minor degree. The Potomac River is about 875 feet wide in this location, between the eastern shore of the river and the eastern shore of Roosevelt Island, and the obstruction caused by the wharf and dock would be negligible. The dock would allow landing along this shoreline, which is currently characterized by a vertical granite revetment wall. Also, the minor impact to boaters would be offset by the improved public access to the waterfront from the Kennedy Center.

The new wharf and dock would generate some changes in boat traffic patterns along this section of the river. It would not necessarily increase the number of commercial and recreational boat trips on the river, but might concentrate more movements in the location of the dock, as patrons or other recreational boaters pull into and out from the dock.

Construction of the wharf and dock would require a Section 10 permit from the US Army Corps of Engineers under the Rivers and Harbors Act of 1899, but it is likely that construction would be

covered under an existing nationwide or regional general permit. The FHWA has already initiated coordination with the Corps of Engineers. That process has led to planning a floating rather than solid-fill structure. (A solid-fill dock would eliminate about 1,200 square feet of bottom habitat, and require an individual Section 10 permit and a permit under Section 404 of the Clean Water Act, which is one reason why alternatives involving a solid-fill pier were dismissed.)

Coordination with the Corps of Engineers also contributed to eliminating the WT-1 alternative, which would have projected further into the river, and would raise concerns by the Corps in terms of its ability to withstand high water, flooding, and debris during flood stages of the Potomac River.

Construction activities near the river and Rock Creek have the potential to cause sedimentation and short-term increases in suspended solids in these waterways, which could adversely affect plant and animal species inhabiting these waterways. The FHWA would require construction contractors to prepare, obtain approval from the DC Watershed Protection Office for, and implement an erosion and sedimentation control plan. Implementation of appropriate erosion and sedimentation control measures would minimize adverse effects on the waterways and their biota.

Construction of Alternative 4 roadways would have no direct impact on Rock Creek. However, under Alternative 4, there is planned reconstruction of the northbound Potomac Freeway intersection with northbound Rock Creek Parkway within 100 feet from the eastern edge of Rock Creek. This part of Rock Creek and its banks are fairly disturbed and unnatural. The use of best management practices during construction should prevent sediment and construction debris from reaching the creek.

Floodplains

Alternative 4 would result in some minor impacts on floodplains, as shown in Appendix A, Figure 4.12-1. Road construction and reconfiguration activities would temporarily increase the physical extent of floodplain, but following the completion of construction activities, the overall increase in floodplain would be minor. Also, any new, post-construction floodplain areas would be equipped with pump-out drainage or similar systems so the areas would not function as floodplain.

The most notable changes would occur in the following areas:

- The Potomac Freeway would be lowered to allow for the deck construction.
- In the southern section of the project area, a new northbound ramp from the Rock Creek Parkway to southbound Ohio Drive would be elevated, requiring the existing roadway beneath to be lowered approximately 10 feet to allow for the proper vertical clearance of the new elevated overpass.

The plaza deck would be constructed to extend north and south of the main Kennedy Center building over the Potomac Freeway and over portions of the floodplain. This construction would not displace any flood-storage capacity of the floodplain in this area. Changes in the intersection of Potomac Freeway and Ohio Drive in the south section of the project area would be largely at-grade and would not displace storage capacity.

The existing underground parking areas at the Kennedy Center have been designed to withstand

floodwater during high water events. The proposed action as envisioned by Alternative 4 would not change this condition.

Executive Order 11988, Floodplain Management, requires consideration of a proposal's impacts on other beneficial uses of the floodplain, in addition to its flood-attenuation benefits. The changes listed above would be consistent with ongoing uses of the floodplain in this area of the District.

Wetlands

There are no wetlands as defined by the US Army Corps of Engineers (i.e., vegetated) in the study area. Thus, no wetlands would be directly impacted by implementation of Alternative 4.

4.12.2.3 Alternative 4V

Waterways

Alternative 4V also includes a connection from the Kennedy Center River Terrace to the waterfront, a wharf on piles, and a floating dock. The connection between the terrace and the waterfront would project about 60 feet over the river at its widest point, in the center of the bowed wharf. A T-section dock would extend another 20 feet into the river.

Implementation of this alternative would remove a larger area of the Potomac River from public use than would Alternative 4. However, the impact would still be minor, considering the width of the river in this location (875 feet). Also, the new dock would provide a landing place for boaters, and the public's access to the waterfront would be improved along the new pedestrian walkways.

Floodplains

Implementation of Alternative 4V would have similar impacts on floodplains as Alternative 4. In addition, reconstruction of the Rock Creek Park/Potomac Freeway Interchange under this alternative would involve construction of ramps through a small, isolated area of floodplain just south of K Street. A ramp from the Potomac Freeway already passes through this portion of floodplain, so the new ramps would be consistent with ongoing uses. The new ramps would be constructed at or possibly below the existing grade. At-grade construction would have no impact on flood storage capacity, while the below-grade construction would increase flood storage capacity. The design process would identify any requirements for pump-out or other floodwater removal measures.

Wetlands

There are no wetlands as defined by the US Army Corps of Engineers (i.e., vegetated) in the project area. Thus, no wetlands would be directly impacted by implementation of Alternative 4V.

4.12.2.4 Mitigation Measures

FHWA would require construction contractors to use approved methods of erosion and sedimentation control, to minimize adverse impacts on Rock Creek and the Potomac River. These

controls would take into account the potential of discharges into the waterways and storm sewers.

Depressed sections of the Potomac Freeway and Ohio Drive would be equipped with pumps or other suitable measures to remove floodwaters.

4.12.3 Biological Resources

4.12.3.1 No Action Alternative

Implementation of the No Action Alternative would generate no impacts on terrestrial vegetation or aquatic organisms.

4.12.3.2 Alternative 4

Terrestrial Vegetation

Construction of Alternative 4 would result in the removal of any vegetation that may occur where roadways and ramps would be placed. As indicated in Subchapter 3.12.3.1, much of the vegetation in the study area consists of landscaped plantings or (near Rock Creek) a mixture of common native (black cherry, black locust, American elm, sycamore, box elder) and invasive (Japanese honeysuckle) species. One group of large-diameter trees occurs in the southern portion of the proposed project area (bordering what would have been the southern side on Constitution Avenue when it originally ended at the Potomac River). These trees appear to have been planted parallel to the old terminus of Constitution Avenue and are part of the West Potomac Park historic landscape. Road reconstruction activities may require the loss of one or two of these large trees west of the existing Potomac Freeway. Relocation would be highly unlikely to be successful, given the size of the trees. During construction, every attempt would be made to minimize impacts on these trees.

Otherwise, implementation of Alternative 4 would generate only minor impacts on vegetation. The vegetation in most of the study area where roads and freeways are to be reconstructed or eliminated is opportunistic. For example, there is no evidence of a planned or landscaped setting along the Potomac Freeway. The grassy areas are mown and the trees appear to be trimmed regularly, but the area does not appear to have been planted according to a landscaping plan. Following completion of planned road improvements, areas adjacent to the roadways would be planted with trees and seeded with grasses or flowers and properly maintained.

The proposed deck and associated changes would affect existing landscaping around the Kennedy Center. However, the deck's plaza would also be landscaped and maintained. The landscaped plaza would more than compensate for the vegetation that would be lost.

Aquatic Organisms

Construction of the wharf and floating dock, particularly placement of pile supports, has the potential to resuspend bottom sediments. Construction activity so near the Potomac River and Rock Creek has the potential to increase suspended solids in these waterways. Suspended solids can obscure visibility, reduce sunlight penetration, decrease water temperature, reduce dissolved oxygen

levels, clog the gills of fish and invertebrates, and change the character of the bottom substrate, adversely affecting bottom-dwelling plants and animals. These impacts would be temporary. The portions of the river and creek adjacent to the site have been previously affected by urban development, stormwater, and sewage discharges. Thus, the bottom flora and fauna are those species tolerant of such impacts.

Suspended sediments could adversely affect fish, particularly anadromous or more mobile species less adjusted to high sediment levels, that are feeding upstream or passing through on their way to spawning grounds. The sediment suspension generated by pile driving is anticipated to be minor and would not affect a large area of the river. The use of erosion and sedimentation controls during construction should minimize inputs of sediments into the two waterways.

The proposed action would have no major negative impacts on the Chesapeake Bay Program's goals, considering the small in-water construction area in relation to the entire "POTTF" segment (upper tidal Potomac River, in which the study area is located) of the watershed. One minor positive impact would be to provide an environmentally sound public-access point to the Potomac River, as it is a major tributary to the Chesapeake Bay. The Chesapeake Bay Program has a goal to increase the number of public access points by 2010; although the boat dock may not be completed by 2010, its creation and use would still be a minor positive impact on the watershed.

Construction of the wharf and dock would likely disrupt hydrilla (*Hydrilla verticillata*), a common species of submerged aquatic vegetation (SAV) found along the shoreline in the study area. Because the deep channel is less than 25 yards from the shore adjacent to the Kennedy Center, existing hydrilla beds are unlikely to extend far into the river, as the currents in the channel are swift. Also, given the low density of all SAV in the study area (less than 50 percent), impacts on SAV would be minor. After construction, shading by the wharf and dock would likely eliminate or reduce the productivity of any SAV below the structures. Such long-term impacts would be negligible because the wharf and dock would only shade a tiny portion of the river and because most existing SAV in the study area is currently distributed on the other side of the river, south of Roosevelt Island (see Subchapter 3.12.3.2).

4.12.3.3 Alternative 4V

Terrestrial Vegetation

Implementation of Alternative 4V would generate similar impacts on vegetation as Alternative 4. However, the plaza design for Alternative 4V is smaller and includes a multi-level cascading fountain, so the area available for planting would be smaller.

Aquatic Organisms

Alternative 4V involves somewhat more construction in the river than Alternative 4. Pile-driving activity may require more time, extending the duration of suspended solids and turbidity. These impacts would still be short-term and would still affect only a small part of the river. Otherwise, impacts to aquatic organisms, including SAV, would be similar to but slightly greater than the impacts generated by Alternative 4.

4.12.3.4 Mitigation Measures

The same measures that would be employed to avoid impacts to waterways under Alternative 4 – use of erosion and sedimentation controls – would protect against impacts to aquatic organisms under Alternative 4V.

4.12.4 Threatened and Endangered Species

4.12.4.1 No Action Alternative

Implementation of the No Action Alternative would not affect the status of threatened or endangered species in the study area.

4.12.4.2 Alternative 4

Shortnose Sturgeon

The shortnose sturgeon (*Acipenser brevirostrum*) is an anadromous endangered species that may swim, spawn, and feed in the Potomac River in the study area. Suspended sediments generated by pile driving can obscure visibility, reduce sunlight penetration, decrease water temperature, reduce dissolved oxygen levels, clog gills, and change the character of the bottom substrate. The sediment suspension could affect adults that are traveling beyond the study area to spawn as well as young of the year, juveniles, and non-spawning adults that are feeding in the Potomac River near the study area.

The site of the wharf and dock construction is too far downstream from the shortnose sturgeon's optimal spawning site (approximately four nautical miles upstream, near Little Falls where a dam prevents farther upstream migration) for the proposed action to affect the spawning substrate. The spawning substrate would remain as it is, capable of allowing shortnose sturgeon eggs to affix to the rocky bottom. It is unlikely that shortnose sturgeon would spawn near the Kennedy Center because they usually spawn in a location with the farthest upstream accessibility (FHWA, March 2000).

Because the deep channel of the Potomac River is less than 25 yards from the wharf and dock construction site (NOAA, 1996), the pile driving in the river could affect foraging young of the year, older juveniles, pre-spawning adults, or adults returning downstream (depending on the season) in the channel near the construction site. Constructing the wharf and floating dock during the time period from late December to early March – when low water temperatures preclude the sturgeon's upstream movement and most young of the year and other juveniles have completed downstream migration – could minimize any deleterious effects on the shortnose sturgeon.

Amphipods

Since the rare amphipods endemic to Rock Creek Park – Hay's spring amphipod (*Stygobromus hayi*) and Ken's amphipod (*Stygobromus kenki*) – require virtually pristine groundwater conditions, it is highly unlikely that either currently exists in the part of Rock Creek Park that is in the study area.

Therefore, Alternative 4 is expected to have no major impacts on either amphipod.

4.12.4.3 Alternative 4V

Alternative 4V would involve somewhat more construction within the river than Alternative 4. Pile-driving activity might require more time, extending the duration of suspended solids and turbidity. These impacts would still be short-term and only affect a small area of the river. Otherwise, impacts to threatened and endangered species would be similar to those generated by Alternative 4.

4.12.4.4 Mitigation Measures

The same measures that would be employed to avoid impacts to waterways – use of erosion and sedimentation controls – would protect against impacts to threatened and endangered species. There is also the option of using turbidity curtains to reduce the effects of sediment suspension during the construction phase for the wharf and boat dock.

When design plans are finalized, FHWA will conduct a formal Section 7 consultation with NMFS to determine appropriate mitigation measures to minimize effects on the shortnose sturgeon.

4.13 Hazardous Materials

Subchapter 3.13 outlines previous and existing industrial/commercial uses within the study area's North and Center Sectors. A database search identified five existing UST sites, one former coal gas site, one existing LUST site, and two existing RCRA SQG sites within or adjacent to proposed access improvement areas for Alternatives 4 and 4V. In addition, fossil-fuel-contaminated soil and groundwater were uncovered adjacent to the Kennedy Center during renovation of the underground parking garages. This contamination is likely due to the former coal gas plant, paving, coal storage facilities, and asphalt plant, located where the Kennedy Center and the Watergate now stand.

4.13.1 No Action Alternative

The No Action Alternative would not disturb any potential hazardous materials on the proposed site. There would be no construction activities, and the paved areas, roads, and freeways would remain as they currently exist. As a result, the No Action Alternative would have no short-term environmental impacts. Any soil and shallow groundwater contamination that might have occurred due to past or present fossil fuel usage would remain in place without abatement; thus, the No Action Alternative would have no long-term environmental benefits.

4.13.2 Alternative 4

Implementation of Alternative 4 might cause short-term environmental impacts during excavation work by emitting dust and vapors containing fossil fuel compounds. Such short-term impacts are expected to be minimal based on air monitoring data for soil excavation work at the Kennedy

Center indicating no detectable airborne releases of coal tar compounds (Taylor, 2002). Further discussion of potential impacts to air quality is provided in Subchapter 4.4.

In addition to fugitive air emissions during soil excavation work, short-term environmental impacts may result from stormwater runoff from excavated contaminated soil piles and discharge to the Potomac River. This short-term release may adversely affect aquatic life in the river, since many of the PAH compounds are toxic to aquatic life and accumulate in fish organs and benthic organisms. The surface water data collected from excavated soil piles during the Kennedy Center parking garage expansion work indicate no detectable releases to surface water. Therefore, the potential, short-term environmental impact from discharge of contaminated surface water and sediment to the Potomac River is expected to be minimal.

Implementing Alternative 4 may effect long-term improvements by replacing contaminated soils with clean fill material.

4.13.3 Alternative 4V

Short-term impacts under Alternative 4V are similar to those under Alternative 4. Implementing Alternative 4V might result in disrupting contaminated soils from two more petroleum sites (one UST site and one LUST site) than Alternative 4 (see Table 3.13-3), although releases from the UST site have not been reported and cleanup work at the other LUST site is ongoing. Therefore, the same potential, short- and long-term impacts under Alternative 4 also apply to Alternative 4V.

4.13.4 Mitigation Measures

Once an alternative is selected, the FHWA would conduct more targeted soil investigations near the access improvements, focusing on the suspected sources and fossil fuel compounds described in Subchapter 3.13. From the soil analytical data, the extent of fossil-fuel-impacted soils would be delineated. The FHWA contractor would prepare environmental management plans that would discuss perimeter air monitoring around contaminated work zones, surface water and sediment erosion controls around excavated contaminated soil piles, and soil characterization sampling and analysis for either off-site disposal or on-site reuse as clean fill material.

If new or replacement utilities must be installed along roadways within contaminated areas, the design documents must evaluate alternatives that include lining the utility trenches with an impervious geomembrane or rerouting utilities away from affected soils. If utilities could not be rerouted away from contaminated areas, lining the utility trench with a geomembrane would mitigate the transport and discharge of fossil fuel compounds in shallow groundwater into the Potomac River.

4.14 Construction-related Impacts

The No Action Alternative would have no construction-related impacts. This subchapter, therefore, only addresses construction-related impacts that would result from implementing either Alternative 4 or Alternative 4V. The construction plan proposed in this EA is divided into broadly-defined stages, which are described in general rather than specific terms. As the design is developed in later phases of the project, the construction stages described in this subchapter might be reordered or altered. Upon completion of the design phase, each stage would be subdivided into more manageable phases to sequence the work logically.

The proposed plaza is the most important improvement, and its construction – with associated ramp reconstruction and lowering of the Potomac Freeway and E Street Expressway – would have substantial, but temporary, short-term impacts on the transportation system and on noise levels in the study area. Proposed improvements in the North and South Sectors would result in fewer and more minor construction-related impacts than those in the Center Sector. Careful staging of improvements in the North and South Sectors might allow construction there to proceed independently of Center Sector improvements.

The following discussions on impacts on air quality, noise, parklands and memorials, cultural resources, aesthetics and viewsheds, socioeconomic and community facilities, urban systems, natural resources, and hazardous materials apply to all stages of construction for both Alternatives 4 and 4V. Construction-related impacts on the transportation system and on Kennedy Center operations and management vary by alternative and stage of construction, and are addressed in Subchapters 4.14.2 and 4.14.3.

4.14.1 Impacts common to Alternatives 4 and 4 V and to All Construction Phases

4.14.1.1 Air Quality

Alternatives 4 and 4V would cause short-term air-quality impacts, primarily from fugitive dust generated during demolition and construction operations. Based on perimeter air monitoring during soil excavation work for the Kennedy Center parking garage expansion project, the short-term impacts are likely to be minimal.

To mitigate potential air-quality impacts, construction contractors would be directed to utilize common dust-suppression measures:

- Where possible, water would be used to control dust generated by demolition activities, construction activities, or grading of roads.
- Asphalt, oil, water, or suitable chemicals would be applied to dirt roads, materials stockpiles, and other surfaces that may create airborne dust. Paved roadways should be maintained in a clean condition.
- Hoods, fans, and fabric filters would be installed to enclose and vent the handling of

dusty materials. Adequate containment methods should be employed during sandblasting or other similar operations.

- Soils exposed for more than short periods would be seeded with fast-growing grasses.

4.14.1.2 Noise

While noise levels could increase substantially for short periods during construction, the impacts are expected to be short-term and concentrated near the area under construction. Impacts on ambient noise levels would include noise from demolition and construction equipment operating at the site as well as from construction or delivery vehicles traveling to and from the site. Noise impacts would vary widely depending on the construction phase (demolition, land clearing and excavation, foundation and capping, construction of new building walls, etc.), the specific task being undertaken, and distance from the activity.

It is not yet known what type of equipment would be used during development of the site. Normally involved are bulldozers and jack hammers during demolition; bulldozers, scrapers, backhoes, and trucks during excavation and grading; backhoes during utility construction; and pile drivers, concrete mixers and pumps, saws, hammers, cranes, and forklifts during construction. Based on typical noise levels generated by such equipment (ranging from 76 to 101 dBA at 15 meters from the equipment), noise-sensitive land uses, such as residences located opposite or near the construction site, could experience high noise levels.

To mitigate potential major construction-noise impacts, construction activities would comply with District regulations. Standard construction-noise specifications, which require the contractor to make every reasonable effort to minimize noise through abatement measures, would be incorporated in the development of construction plans. Abatement measures could include:

- Equipping all construction equipment powered with internal combustion engines with properly-maintained mufflers.
- Ensuring that air compressors meet current U.S. EPA noise-emission standards.
- Using new construction equipment as much as possible, since it is generally quieter than older equipment.
- Minimizing potential nighttime construction activities.

4.14.1.3 NPS Parkland and Memorials

Construction activity would generate short-term impacts, which might include temporary disruption of park activities; rerouting of pedestrians, bicyclists, and motorized vehicles; dust; noise; and soil erosion. The length and extent of these disturbances would vary by project element. Mitigation measures would include controlling soil erosion and dust by following NPS soil erosion control guidance, protecting nearby trees and replacing affected landscaping, restricting working hours to avoid disruptive noise levels during active-use periods, and maintaining traffic flow.

FHWA is preparing a memorandum of agreement (MOA) with NPS and the DC SHPO concerning archaeological survey work that would occur during the design phase of the project, according to

Section 106 of the National Historic Preservation Act. Proposed construction activity or construction-related activity in the area where the new Rock Creek Parkway and Potomac Freeway ramps would be constructed would constitute an adverse impact to known and potential archaeological resources in this area, and the MOA would identify avoidance actions to be taken.

Under Alternative 4, NPS Reservations 720, 103, and 104 – all in the vicinity of Virginia Avenue and E Street (see Appendix A, Figure 3.6-1) – and 106 at Virginia Avenue and 21st Street, would be adversely affected temporarily by construction. Removal of the E Street Expressway ramp to Virginia Avenue just north of the State Department and reconstruction of the E Street Expressway tunnel to accommodate an additional lane of traffic (see Appendix A, Figure 4-6.3) would cause considerable disruption. While demolishing the ramp up to Virginia Avenue alone would not cause much disruption, reopening and widening the cut-and-cover tunnel would affect everything on top of and near the tunnel from 23rd to 21st Streets.

Additionally, about 2.6 acres, some of it owned and managed by NPS, would be temporarily disturbed by construction under Alternative 4. Reopening the cut-and-cover tunnel would require moving the Gálvez Statue (NPS Reservation 720) and whatever landscaping could be salvaged into storage, and permanently removing the remainder of the trees, woody shrubs, and planting beds. It would take many years for new trees to reach the heights of the mature landscape trees in the affected area. Mitigation would include rebuilding and re-landscaping the NPS reservations on the restored cover over the E Street Expressway.

Because Alternative 4V does not include removing the ramp from the E Street Expressway to Virginia Avenue, reconstruction of the E Street Expressway tunnel would not be necessary (see Appendix A, Figures 2-15 and 4.6-7). Consequently, short-term construction impacts would affect only about 0.3 acres of NPS Reservations 720 and 104. The land affected would be concentrated over the E Street Expressway just west of the Virginia Avenue underpass. The impacts would be similar to those described for Alternative 4, but much reduced in scale and duration.

To minimize harm to NPS parkland:

- Soil erosion control and stormwater management plans would be developed and approved before construction begins. Best-management practices would be used during construction to minimize soil erosion, airborne dust, and sediment-laden stormwater flows into Rock Creek and the Potomac River.
- Construction zones would be delineated clearly, using fencing or some less visible means, to protect nearby trees and shrubs from damage. Any removed landscaping (such as over the E Street Expressway) would be replaced at NPS's discretion.
- Necessary detours for park trails and roads would be planned and clearly marked in conjunction with NPS.
- The locations of construction staging areas and temporary access roads would be planned in conjunction with NPS.
- The final design of new trails, the pedestrian/bicycle bridge over Rock Creek, and the Alternative 4 bridge at Ohio Drive/Potomac Freeway/Rock Creek Parkway would be planned in conjunction with NPS.

- Hours of construction would be arranged with park managers to reduce noise levels during any sensitive periods or events.

All required local and federal permits would be obtained prior to and complied with during construction.

4.14.1.4 Cultural Resources

All impacts on archeological resources are construction-related and are discussed in detail in Subchapter 4.7. Only some architectural resources would experience construction-related impacts; they are described in the following paragraphs. A construction-related impact is considered to be an adverse effect if it results in permanent diminution of the integrity of the property (see Table 4.7-1).

Much construction work would occur near several architectural resources within the area of potential effect (APE). Construction-related impacts, such as noise, dust, truck traffic, and unsightliness would temporarily disrupt the integrity of these resources' surroundings. Due to their short duration, these impacts would not constitute adverse effects on the resources. However, some resources would be affected more than others based on proximity to construction sites.

Most affected would be the Potomac Naval Annex Historic District and associated resources (Old Naval Observatory, 2430 E Street Buildings) overlooking the site of the proposed deck; West Potomac Park and associated resources (Lincoln Memorial, Memorial Bridge and approaches) near the Potomac Freeway/Ohio Drive intersection and the Center Sector; the Rock Creek Parkway, which would gain new connections to the Potomac Freeway in the North Sector; the pedestrian link from the Kennedy Center River Terrace to the riverfront that would span the parkway; and the L'Enfant Plan, if new reservations are added on the deck over the Potomac Freeway.

Less severe construction-related impacts would affect the following resources: the Foggy Bottom Historic District (the western edge would experience some impacts during improvements proposed for the North Sector); the C&O Canal Historic District (same impacts); and the northwestern corner of the Northwest Rectangle Historic District (due to its proximity to E Street and the ramp from the E Street Expressway proposed for demolition).

Mitigation would include visually shielding cultural resources from construction with landscape screening. Other methods to mitigate adverse effects would be explored during the design phase.

4.14.1.5 Aesthetics and Viewsheds

Aesthetics and viewsheds would be temporarily affected by the visibility of construction activity and materials, such as fencing, detour signs, and construction equipment.

4.14.1.6 Socioeconomics and Community Facilities

Employment, Earnings, and Expenditures

Construction expenditures would generate direct and indirect temporary jobs as the earnings from the construction employment circulate in the local economy. Detailed estimates of construction

costs associated with the deck, roadways, and the two new buildings are not yet known, but the \$400 million (2003\$) authorized for the project can serve for modeling purposes. Models project the number of direct and indirect, construction-related jobs generated by the project and estimate the total economic impact of construction expenditures on the District and region (see Subchapter 4.9).

At the regional level, construction employment is projected to total 2,417 direct and 3,325 indirect person-year jobs. If the redevelopment were projected to occur evenly over three years, the average per year would result in roughly 806 direct construction jobs and 1,109 indirect construction jobs for the region. In reality, a series of spikes and troughs in the intensity of employment is more likely.

Regional modeling affords a more accurate perspective on the larger economic impacts of the project than modeling for the District alone. Applying average annual construction wages of \$37,000 in the Washington metropolitan area (US Bureau of Labor Statistics, 2003), the model returns an estimate of \$89.4 million for total earnings from the direct construction jobs and an additional \$77.8 million for total earnings from indirect employment. Thus, total temporary, construction-related earnings are estimated at \$167.2 million.

Temporary construction employment would also provide additional income taxes. Using the high estimate of construction costs and assuming that 33 percent of the total construction employment occurs in each of three years, an estimated \$1.09 million per year in new income taxes would be generated for the District from direct and indirect construction employment. Additional revenues from temporary construction employment also include sales taxes, as discussed in Subchapter 4.9. Short-term revenues of more than \$2.3 million from these sources are projected over each year of a three-year construction period.

Community Facilities

Construction during Alternatives 4 and 4V might lead to short-term, negative impacts by increasing response times for fire, EMS, and police services as a result of traffic detours and construction-related delays. Careful planning for maintenance of traffic flow during construction would minimize disruptions and largely mitigate these potential negative effects on emergency services.

4.14.1.7 Urban Systems

Under Alternatives 4 and 4V, all impacts on urban systems would occur during construction; see Subchapter 4.11.2 for a detailed discussion.

4.14.1.8 Natural Resources

Under Alternatives 4 and 4V, many impacts on natural resources would occur during construction; see Subchapter 4.12 for a detailed discussion.

4.14.1.9 Hazardous Materials

Under Alternatives 4 and 4V, all impacts on hazardous materials would occur during construction; see Subchapter 4.13 for a detailed discussion.

4.14.2 Alternative 4 Impacts

4.14.2.1 Stage I

Under Alternative 4, Stage I applies principally to the Center Sector and is expected to last approximately one and a half to two years.

Major Construction Activities

In Stage I, the major construction activities are the demolition of the ramp bridge connecting southbound Potomac Freeway to eastbound E Street Expressway and the reconstruction of the northbound lanes of the freeway and the westbound expressway ramp to northbound freeway. The freeway would be lowered approximately 20 feet at the location of the proposed deck and tapered back to meet the existing grades at Juarez Circle in the north and the underpass at the off ramp from Roosevelt Bridge to northbound freeway in the south. Simultaneously, the expressway tunnel (westbound this phase) would be lowered to be at grade with the new freeway; the expressway vertical alignment would be altered as far east as 24th Street. The lowering and reconstruction of the freeway and expressway would be a major effort, continuing in Stages II and III.

Lowering of the freeway and expressway by 20 feet and their reconstructions would be very disruptive, particularly to residents of the Columbia Plaza complex and Potomac Naval Annex. Lowering the roadways requires extensive excavation of rock, which would require either controlled blasting or removal by mechanical means using rock hammers and excavators. During this phase, some of the foundation for the deck would also be constructed.

Construction-related Impacts on the Transportation System

To accommodate the aforementioned construction activities, Stage I of Alternative 4 would alter traffic patterns, in general disrupting them moderately, with the largest disruption being the closing of the ramp from eastbound Roosevelt Bridge to northbound Potomac Freeway. The ramp from southbound Potomac Freeway to eastbound E Street Expressway would close permanently, but it would improve traffic flow from the eastbound Roosevelt Bridge ramp to the eastbound E Street Expressway. Stage I would most likely require the following major closings and detours:

- Close southbound Potomac Freeway between the exit ramp to Roosevelt Bridge (just south of Juarez Circle overpass) and the off ramp from Roosevelt Bridge (just north of Ohio Drive). Access would be maintained from southbound Potomac Freeway to westbound Roosevelt Bridge and from eastbound Roosevelt Bridge to the southbound freeway at Ohio Drive.
- Detour southbound Potomac Freeway traffic destined for eastbound E Street Expressway to K Street and Virginia Avenue.
- Detour southbound Potomac Freeway traffic to reconfigured on/off ramps (as a bypass) to continue to Ohio Drive.
- Detour westbound E Street Expressway traffic destined for northbound Potomac Freeway to Virginia Avenue and 23rd Street.

- Detour eastbound Roosevelt Bridge traffic destined for northbound Potomac Freeway to eastbound E Street Expressway and northbound 20th Street.
- Close northbound Potomac Freeway and shift traffic to southbound freeway lanes between exit ramp to Roosevelt Bridge (just south of Juarez Circle overpass) and off ramp from Roosevelt Bridge (just north of Ohio Drive).

In this stage, there would be little or no impact to pedestrians and bicyclists.

Construction-related Impacts on Kennedy Center Operations and Management

No impacts to Kennedy Center operations and management are anticipated at Stage I, except for those related to noise. Construction activities related to lowering and reconstructing the Potomac Freeway would generate considerable noise. This would be most disruptive during daylight hours and would cause moderate interference with Kennedy Center activities, such as events at the Millennium Stage and tour groups visiting the facility. During evening hours, construction noise would interfere with performances staged at the Center, such as ballet and opera performances or concerts by the National Symphony. Accordingly, evening construction activities would be limited to nights without performances.

4.14.2.2 Stage II

Under Alternative 4, Stage II applies primarily to the Center Sector and is expected to last approximately one and a half to two years.

Major Construction Activities

The major Stage II activity is the reconstruction of the southbound lanes of Potomac Freeway, including a new exit ramp to westbound Roosevelt Bridge and demolition and reconstruction of the ramp bridge from westbound E Street Expressway to westbound Roosevelt Bridge. The lowering and reconstruction of the freeway and expressway would also be ongoing, as described for Stage I (see Subchapter 4.14.2.1), and would continue to be very disruptive.

Construction-related Impacts on the Transportation System

Traffic patterns would be disrupted considerably with the closing of the ramp from westbound E Street Expressway to westbound Roosevelt Bridge, but careful staging of the work would minimize the time between demolition of the existing ramp and the opening of the new ramp. Southbound Potomac Freeway traffic flow would not continue to Ohio Drive during this stage of construction. Stage II would require the following major closing, opening, and detour:

- Open northbound Potomac Freeway between Ohio Drive and Juarez Circle overpass (closed and rebuilt in Stage I).
- Close the bypass for southbound Potomac Freeway traffic; appropriate detours would be designed for vehicular traffic destined for Ohio Drive or westbound Roosevelt Bridge.
- Detour westbound E Street Expressway traffic destined for westbound Roosevelt Bridge. Traffic would use northbound Potomac Freeway, 27th Street, and then the

southbound freeway to access the westbound Roosevelt Bridge ramp.

In this stage, there would be some impact to pedestrians and bicyclists. Construction activities along the ramp for southbound Potomac Freeway to westbound Roosevelt Bridge would disrupt use of the trail to and from the Kennedy Center and 25th Street and the north side of the Roosevelt Bridge. During certain activities, it would be necessary to realign the trail to protect users from adjacent construction. Any detour, however, would be minimal, but shifted away from activities that might be dangerous.

Construction-related Impacts on Kennedy Center Operations and Management

Given the proximity of the construction activities in Stage II, minor impacts to Kennedy Center operations and management are anticipated, in addition to those related to noise, which are described for Stage I in Subchapter 4.14.2.1. Reconstruction of the ramp for southbound Potomac Freeway to westbound Roosevelt Bridge would disrupt use of the new button-hook exit from 25th Street to Roosevelt Bridge for those patrons returning to Virginia. Staging construction to allow this new exit to be functional as often as possible would minimize impacts to exiting traffic.

4.14.2.3 Stage III

Under Alternative 4, Stage III applies principally to the Center Sector and is expected to last approximately two years.

Major Construction Activities

In Stage III, the major activity is the lowering and reconstruction of the eastbound E Street Expressway (the section between the eastbound Roosevelt Bridge exit ramp and 20th Street), which would require lowering its elevation profile to match the newly-reconstructed and -lowered northbound Potomac Freeway, demolition of the exit ramp to Virginia Avenue and westbound E Street, and widening of the tunnel to 20th Street to accommodate a third lane. Extensive underpinning and possibly tie-back systems would be required to support the existing retaining walls in the area with the lowered profile.

Additional construction during Stage III includes the new parking garage just east of the Kennedy Center, as well as foundations for the proposed deck.

Construction-related Impacts on the Transportation System

The construction of the new garage is potentially very disruptive to Kennedy Center operations and management and the ability to move patrons in and out of the existing garages. Careful staging of the construction would allow closings or detours of 25th Street to be as brief as possible. Construction of the deck over the garage (the majority of the deck would be built in the next stage) would allow that portion of the deck to be used for access during various phases of construction.

Traffic patterns would be disrupted considerably with the closing of eastbound E Street Expressway. Major closings and detour include:

- Close eastbound E Street Expressway between the exit ramp from eastbound Roosevelt Bridge and 20th Street.
- Close eastbound E Street Expressway exit ramp to Virginia Avenue and westbound E Street.
- Detour eastbound Roosevelt Bridge traffic destined for eastbound E Street Expressway to Virginia Avenue and K Street via northbound Potomac Freeway and 27th Street.

In this stage, impacts to pedestrians and bicyclists would increase with the building of the new garage. As for vehicles, 25th Street is a major route for pedestrians and bicyclists traveling to and beyond the Center. To maintain traffic flow and safety, careful staging of the construction and special efforts to protect pedestrians and bicyclists would be required. During certain activities, it would be necessary to realign the trail to protect users from adjacent construction. At times, a detour would be used to take users closer to the front of the Kennedy Center and away from construction activities.

Construction-related Impacts on Kennedy Center Operations and Management

Given the proximity of the construction activities in Stage III, additional major impacts to Kennedy Center operations and management are anticipated. Construction activities related to the new garage, while less intense than those associated with excavating the freeway, would be much closer and have greater impact. Major excavation to build the garage is also expected, and construction activities would need to be coordinated to minimize interference with Kennedy Center events.

Construction of the new garage would disrupt one of the major ingress points to the Kennedy Center. Construction of temporary roads or portions of the deck (the majority to be built in the next phase) would maintain access to the garage. Delivery vehicles would require special attention. Tour activities would be considerably impacted, as most tours occur during daytime hours when construction would be most active.

4.14.2.4 Stage IV

For Alternative 4, Stage IV applies to the North and Center Sectors and is expected to last approximately two years.

Major Construction Activities

In Stage IV, the major activities are the deck/plaza construction over the Potomac Freeway and the deck extension over the E Street Expressway to 23rd Street and Virginia Avenue. Deck construction would be sequenced to minimize impacts on Kennedy Center operations and management, such as parking garage access. Concurrently, construction of the new buildings may begin. This is likely to be disruptive not only to patrons, but also to residents of the Columbia Plaza complex and the Potomac Naval Annex.

Most roadway improvements in the North Sector would also occur in this stage, including new connections between Potomac Freeway, Rock Creek Parkway, and 27th Street, and the reconstruction of 27th Street in stages.

Construction-related Impacts on the Transportation System

Traffic interruptions would occur on the Potomac Freeway and E Street Expressway while erecting the deck's frame. This would also necessitate minor detours or the narrowing of travel lanes to allow placement of cranes. Careful staging of the work and lane closings during construction – restrictions would be in place during rush hour – would facilitate traffic detours. Stage IV major closings include:

- Partial closings of E Street Expressway and Potomac Freeway to allow construction of the overhead deck; only intermittent detours are expected.
- Partial closing of 27th Street to allow reconstruction; no detours are expected.

Impacts to pedestrians and bicyclists would increase as deck-building activities occur in front of the Kennedy Center. As in Stage III, maintaining traffic flow and safety along 25th Street would require careful staging of construction activities, and trail realignments, temporary closings, and detours might be required periodically to protect users.

Construction-related Impacts on Kennedy Center Operations and Management

Construction of the elevated, at-grade deck and the disruption of 25th Street, a principal route to the Kennedy Center garages, would have major, if temporary, impacts on Center operations and management. Traffic maintenance and protection measures would continue, with particular attention paid to performance schedules and set deliveries. Tour activities would continue to be impacted considerably, as most tours occur during the daytime hours, when construction would be most active. Construction of temporary roads or portions of the deck would maintain access to the garages, and delivery vehicles would require special attention.

4.14.2.5 Stage V

For Alternative 4, Stage V applies only to the South Sector, and is expected to last approximately one and a half to two years.

Major Construction Activities

Major activities in Stage V are the construction of the new overpass bridge and the lowering and reconstruction of Ohio Drive between the exit for Lincoln Circle and the Belvedere. The northbound Ohio Drive connections to Potomac Freeway and Roosevelt Bridge would be rebuilt, and a new ramp would be created for northbound Rock Creek Parkway traffic exiting from eastbound Roosevelt Bridge. Next, Ohio Drive between the exit ramp for Lincoln Circle and the Belvedere at the parkway would be closed to allow construction of the new overpass structure.

Construction-related Impacts on the Transportation System

Bridge construction would cause complex traffic detours, but certain connections – i.e., from eastbound Roosevelt Bridge to northbound Rock Creek Parkway – would be maintained. A temporary bypass would divert northbound Ohio Drive traffic and southbound Rock Creek Parkway traffic (destined for Ohio Drive) to the Potomac Freeway. The largest impact would affect

traffic exiting from eastbound Roosevelt Bridge. Early construction of the northbound Rock Creek Parkway ramp would minimize northbound congestion, but southbound traffic to Ohio Drive and Independence Avenue would require temporary detours to Constitution Avenue and 17th Street.

Stage V roadway improvements would result in several major closings and detours:

- Construct a temporary bypass for Ohio Drive and Potomac Freeway traffic around location of proposed overpass bridge.
- Close Ohio Drive between exit ramp for Lincoln Circle and the Belvedere.
- Detour all northbound Ohio Drive traffic to Potomac Freeway.
- Detour southbound Rock Creek Parkway traffic destined for Ohio Drive to the Potomac Freeway.

Only two pedestrian/bicycle trails would require attention. The first, parallel to Ohio Drive as it passes along the Watergate Steps and beneath the Parkway drive overpass, would need to be protected to maintain the connection to the Belvedere through the area now used for volleyball courts. The second important trail is the connection with the south side of Roosevelt Bridge. Mitigation would include construction of a new parallel trail to the off ramp and the return to the new pedestrian/bicycle bridge cantilevered off the existing eastbound ramp to Constitution Avenue. This would remove and protect traffic that crosses the Potomac Freeway to gain access to the Mall.

Construction-related Impacts on Kennedy Center Operations and Management

It is unlikely that Kennedy Center operations and management would be affected during Stage V. Traffic patterns might delay some patrons, but this would be a minor impact and could be mitigated through careful phasing of construction activities.

4.14.3 Alternative 4V Impacts

4.14.3.1 Stage I

Stage I activities under Alternative 4V would take place principally in the Center Sector and are expected to last approximately one and a half to two years.

Major Construction Activities

For Alternative 4V, major construction activities in Stage I would be the same as in Alternative 4.

Construction-related Impacts on the Transportation System

For Alternative 4V, construction-related impacts on transportation in Stage I would be the same as those described for Alternative 4.

Construction-related Impacts on Kennedy Center Operations and Management

For Alternative 4V, construction-related impacts on Kennedy Center operations and management in Stage I would be the same as those described for Alternative 4.

4.14.3.2 Stage II

The Center Sector would be the principal site of Stage II activities, which are expected to last approximately one and a half to two years.

Major Construction Activities

For Alternative 4V, major construction activities in Stage II would be the same as in Alternative 4.

Construction-related Impacts on the Transportation System

For Alternative 4V, construction-related impacts on transportation in Stage II would be the same as those described for Alternative 4.

Construction-related Impacts on Kennedy Center Operations and Management

For Alternative 4V, construction-related impacts on Kennedy Center operations and management in Stage II would be the same as those described for Alternative 4.

4.14.3.3 Stage III

For Alternative 4V, Stage III applies mostly to the Center Sector and is expected to last approximately two years.

Major Construction Activities

Major construction activities in Stage III would be the same as under Alternative 4, but no demolition of the Virginia Avenue exit ramp or widening of the 20th Street tunnel would occur.

Construction-related Impacts on the Transportation System

Under Alternative 4V, construction-related impacts to transportation in Stage III would be the same as under Alternative 4. Traffic patterns would be disrupted considerably with the closing of eastbound E Street Expressway. Major closings and detours would be the same as under Alternative 4, except that the eastbound E Street Expressway exit ramp to Virginia Avenue and westbound E Street, while closed during this stage, would not be demolished.

Under Alternative 4V, construction-related impacts to pedestrians and bicyclists in Stage III would be the same as under Alternative 4.

Construction-related Impacts on Kennedy Center Operations and Management

For Alternative 4V, construction-related impacts on Kennedy Center operations and management in Stage III would be identical to those described for Alternative 4.

4.14.3.4 Stage IV

Under Alternative 4V, Stage IV would apply to the Center and South Sectors and is expected to last approximately two years.

Major Construction Activities

Under Alternative 4V, major construction activities in Stage IV would be identical to those under Alternative 4, but roadway improvements would be initiated in the South rather than the North Sector. Improvements include new connections between the Potomac Freeway and Ohio Drive and a new signalized intersection in the South Sector.

Construction-related Impacts on the Transportation System

Under Alternative 4V, construction-related impacts to transportation in the Center Sector in Stage IV would be similar to those described for Alternative 4, with traffic patterns being considerably disrupted on the Potomac Freeway and E Street Expressway while erecting the deck's frame. In the South Sector, partial closings and detours of the Potomac Freeway and Ohio Drive would be required to construct the new, at-grade, signalized intersection. Careful phasing of the work and proper attention to maintaining traffic flow would minimize disruption.

Under Alternative 4V, construction-related impacts to pedestrians and bicyclists in the Center Sector for Stage IV would be the same as for Alternative 4. In the South Sector, the two trails discussed Subchapter 4.14.2.5 would require the same protective measures.

Construction-related Impacts on Kennedy Center Operations and Management

Under Alternative 4V, construction-related impacts on Kennedy Center operations and management in Stage IV would be identical to those described for Alternative 4.

4.14.3.5 Stages V and VI

For Alternative 4V, Stages V and VI apply to the North and South Sectors and are expected to last approximately one and a half to two years combined.

Major Construction Activities

In Stages V and VI, the major activities are the construction of the new overpass bridge in the North Sector and the completion of at-grade connecting roads in both the North and South Sectors.

Construction-related Impacts on the Transportation System

In the North Sector, at-grade connections would be made between the Potomac Freeway and Rock Creek Parkway and 27th Street. To maintain traffic flow, 27th Street would be rebuilt in phases. The most important activity – construction of the new overpass for northbound Potomac Freeway traffic destined for 27th Street – would be moderately disruptive. In the South Sector, connecting roads to Potomac Freeway and Ohio Drive, started in Stage IV, would be completed in Stage V. This would be relatively minor work, and standard construction techniques and traffic control should minimize disruptions.

In this stage, there would be little impact to pedestrians and bicyclists. The two trails in the South Sector discussed in Stage IV would continue to be protected, and the new trail and bridge to the Mall would prevent access to the Mall for through traffic crossing the Potomac Freeway.

Construction-related Impacts on Kennedy Center Operations and Management

Under Alternative 4V, construction-related impacts on Kennedy Center operations and management in Stages V and VI would be the same as those described for Alternative 4, Stage V.